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A VERTEBRATE FAUNA OF THE MALAY PENINSULA

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ISTHMUS OF KRA TO SINGAPORE

INCLUDING THE ADJACENT ISLANDS.

*PUBLISHED UNDER THE AUTHORITY OF THE GOVERNMENT
OF THE FEDERATED MALAY STATES.*

EDITED BY H. C. ROBINSON, C.M.Z.S.,
DIRECTOR OF MUSEUMS, FEDERATED MALAY STATES.

REPTILIA and BATRACHIA.

BY

GEORGE A. BOULENGER, D.Sc., Ph.D., F.R.S.

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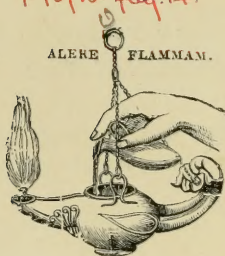
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PREFACE.

THE present volume on the Reptiles and Batrachians by Mr. G. A. Boulenger forms the first instalment of a Vertebrate Fauna of the Malay Peninsula, issued by authority of the Federated Malay States Government.

Though, to a large extent, the ground traversed is covered by Blanford's 'Fauna of British India,' some eighty per cent. of the Malayan species occurring also in Tenasserim, it is considered that a comprehensive account of the Peninsular fauna in a convenient and readily accessible form, will be of advantage to Zoology in general and to local workers in particular.

The plan of the work has been that of the 'Fauna of British India,' to which it may be regarded as supplementary, and references to literature, especially in the case of species common to both this and that fauna, have been cut down as much as possible, though a fairly full synonymy has been given for all forms which do not occur outside Malayan limits, which, for present purposes, may be defined as comprising the area from the British Indian border and the Isthmus of Kra, south to Singapore, including all adjacent islands within the twenty-fathom line, but excluding

the Rhio-Lingga archipelago, which politically belongs to Netherlands India and faunistically is allied to Sumatra, rather than to the Malay Peninsula.

Of this area, it may be confidently stated that our knowledge of the southern two-thirds, or that portion under British control, is as complete as that of any similar area in Asia, and that, as regards actual species, very few more remain to be discovered, though, of course, much has still to be accomplished in the department of general bionomics.

In the northern third, which includes the Siamese and Malayo-Siamese states usually known as Lower Siam, there is scope for much more work, and it will probably be found that when this district is thoroughly investigated, the range of many Tenasserimese and Siamese species not at present included in our fauna will be extended in this direction. In particular, the mountainous country in Nakawn Sitamarat between latitudes 8° and 9° N. on the east coast of the Peninsula may be expected to yield interesting novelties.

The appended table serves to show the rate at which, during the last thirteen years, our knowledge of the fauna of the Malay Peninsula has been increased. As a matter of fact the increase has been even greater than the figures indicate, as certain species formerly included in the local lists have been shown not to exist within the area, and are therefore excluded from the latest account.

	Flower, 1899.	Boulenger, 1903.	Boulenger, 1912.
REPTILIA.			
EMYDOSAURIA (Crocodiles)	3	3	3
CHELONIA (Tortoises & Turtles). 19		23	23
SQUAMATA.			
<i>Lacertilia</i> (Lizards)	49	71	81
<i>Ophidia</i> (Snakes)	111	129	131
	<hr/> 182	<hr/> 226	<hr/> 238

	Flower, 1899.	Boulenger, 1903.	Boulenger, 1912.
BATRACHIA.			
ECAUDATA (Frogs & Toads)	40	58	64
APODA (Cæcilians)	2	2	2
	<hr/> 42	<hr/> 60	<hr/> 66

The literature on Malayan herpetology is not very extensive, and, excluding systematic works and museum catalogues, all that is of any great importance will be found in the following papers, which are duly referred to in their proper sequence :—

- CANTOR, THEODORE.—“Catalogue of Reptiles inhabiting the Malayan Peninsula and Islands.” *Journal Asiatic Society of Bengal*, xvi, pp. 607–656, 897–952, 1026–1078 (1847); reprinted in *Miscellaneous Papers relating to Indo-China* (1st series), vol. ii, pp. 112–257, London, 1886.
- GÜNTHER, A.—“The Reptiles of British India.” * *Ray Society*, London, 1864.
- STOLICZKA, F.—“Observations on some Indian and Malayan Amphibia and Reptilia.” *Journ. Asiat. Soc. Bengal*, xxxix (ii) pp. 134–228, pls. ix–xii (1870).
- IDEM.—“Notes on some Species of Malayan Amphibia and Reptilia.” *Journ. Asiat. Soc. Bengal*, xlii (ii) pp. 111–126, pl. xi (1873); reprinted in *Miscellaneous Papers relating to Indo-China* (2nd series), vol. i, pp. 72–87, London, 1887.
- FLOWER, STANLEY SMITH.—“Notes on a Collection of Reptiles and Batrachians made in the Malay Peninsula in 1895–6; with a List of the Species recorded from that Region.” *Proc. Zool. Soc. London*, 1896, pp. 856–914, pls. xlv–xli.
- IDEM.—“Notes on a Second Collection of Reptiles made in the Malay Peninsula and Siam from November 1896 to September 1898; with a List of the Species recorded from those Countries.” *Proc. Zool. Soc. London*, 1899, pp. 600–696, pls. xxxvi, xxxvii.
- IDEM.—“Notes on a Second Collection of Batrachians made in the Malay Peninsula and Siam from November 1896 to

* The Malay Peninsula is also included in the scope of this work.

- September 1898; with a List of the Species recorded from those Countries. *Proc. Zool. Soc. London*, 1899, pp. 885-916, pls. lix, lx.
- LAIDLAW, F. F.—“On the Frogs collected during the ‘Skeat Expedition’ to the Malay Peninsula, 1899-1900.” *Proc. Zool. Soc. London*, 1900, pp. 883-890, pl. lvii.
- IDEM.—“On a Collection of Lizards from the Malay Peninsula made by Members of the ‘Skeat Expedition,’ 1899-1900.” *Proc. Zool. Soc. London*, 1901 (i) pp. 301-311.
- IDEM.—“List of a Collection of Snakes, Crocodiles, and Chelonians from the Malay Peninsula made by Members of the ‘Skeat Expedition,’ 1899-1900.” With an Appendix containing a list of the names of the places visited by the ‘Skeat Expedition.’ By W. W. SKEAT. *Proc. Zool. Soc. London*, 1901 (ii) pp. 575-586, pl. xxxv.
- BUTLER, A. L. “On Recent Additions to the Batrachian Fauna of the Malay Peninsula.” *Proc. Zool. Soc. London*, 1902 (ii) pp. 188-190.
- BOULENGER, G. A. “Report on the Batrachians and Reptiles. With an Appendix containing a list of the Batrachians and Reptiles recorded from the Malay Peninsula, south of Tenasserim.” *Fasciculi Malayenses, Zoology*, vol. i, pp. 131-176, pls. v-x (1903).
- BUTLER, A. L.—“A List of the Batrachians known to inhabit the Malay Peninsula; with some Remarks on their Habits, Distribution, etc.” *Journal of the Bombay Natural History Society*, vol. xv, pp. 193-204, 387-402 (1903-4).
- ROBINSON, H. C.—“Further Additions to the Batrachian Fauna of the Malay Peninsula, with a list of the species at present known to occur therein.” *Journal Federated Malay States Museums*, vol. i, pp. 19-24 (1905).
- BOULENGER, G. A.—“Report on the Gunong Tahan Expedition, May to September 1905. III. Report on the Fishes, Batrachians, and Reptiles.” *Journ. Fed. Malay States Mus.* vol. iii, pp. 61-72, pls. iv, v (1908).

The descriptions throughout are based by the author on the unrivalled collections in the British Museum, supplemented in some few cases by specimens in the Selangor, Perak, and Singapore Museums, from which collections the

range given for certain of the rarer species is in many cases derived.

For permission to utilize many of the blocks prepared for the 'Fauna of British India,' which has added greatly to the value of the present work, the Government of the Federated Malay States is indebted to the Secretary of State for India; a few illustrations are derived from previous publications of Mr. Boulenger, while the remainder have been specially prepared.

Acknowledgments must be made to all those who by the gift of specimens or otherwise have aided in the preparation of this work, amongst whom Dr. J. D. Gimlette and Dr. A. G. H. Smart, of the Kelantan Medical Service, must be specially mentioned, the large and excellently preserved collections of snakes presented by these gentlemen to the British Museum having greatly helped to elucidate the distribution of many of the species. Thanks are also due to Dr. R. Hanitsch, of the Raffles Museum, Singapore, for information regarding the collections under his care.

The large collections made by Capt. S. S. Flower, and presented by him to the British Museum, supplemented by his excellent papers, have been of the greatest help to the author in the preparation of this work.

In conclusion, it may not be amiss to indicate to those specially interested in the groups with which this volume deals certain problems to which their attention may be profitably directed.

Such problems are :—

- (i.) The occurrence and distribution in the Peninsula of the Marsh Crocodile (*Crocodilus palustris*) (p. 5).

- (ii.) The number of species of soft-shelled Turtle (*Trionychidæ*) existing in the Peninsula, and the distribution thereof.
- (iii.) The range and distribution of the hard-shelled River Tortoises commonly known as *tuntong* (genera *Batagur*, *Callagur*, and *Orlitia*).
- (iv.) The species of small nocturnal or burrowing Snakes, such as *Lycodon*, *Ablabes*, *Simotes*, and *Calamaria*.
- (v.) The Sea-Snakes generally (*Hydrophiinæ*).
- (vi.) The family *Amblycephalidæ*.

Among the Batrachians information is especially required about the breeding-habits; and series of tadpoles, well preserved and accompanied if possible by the adults, would be valuable additions to the British Museum collection or to those of any of the local institutions. Very little also is known about the range and habits of the two Cæcilians (*Ichthyophis*), which appear to be very rare in the southern half of the Peninsula.

HERBERT C. ROBINSON.

Federated Malay States Museums,
Kuala Lumpur.

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Class REPTILIA.

Cold-blooded Vertebrates breathing by lungs throughout their existence, the body covered with scales or scutes. Skull with the parasphenoid small, if distinct, with a basioccipital usually articulating with the vertebral column by a single condyle.

Represented in the Malay Subregion by three Orders :—

I. EMYDOSAURIA, Crocodiles.

II. CHELONIA, Tortoises and Turtles.

III. SQUAMATA, Lizards and Snakes.

Order EMYDOSAURIA.

Quadrate bone immovably united to cranial arches; two horizontal bony temporal arches. Cervical and dorsal ribs mostly two-headed, the middle dorsals articulating with the transverse processes of the neural arch. Sternum and interclavicle present; no clavicles; abdominal ribs. Pubis excluded from acetabulum. Teeth implanted in sockets. Ventricle of the heart divided by a complete septum. Pectoral and abdominal cavities separated by a muscular diaphragm. Vent longitudinal; copulatory organ present, single.

A single family.

Family CROCODILIDÆ.

Nares anterior; choanæ opening far back between the pterygoids, which, like the palatines and maxillaries, are produced into osseous plates joining on the median line of the palate; orbit communicating with the infratemporal fossa. Vertebrae procœlous; ribs with

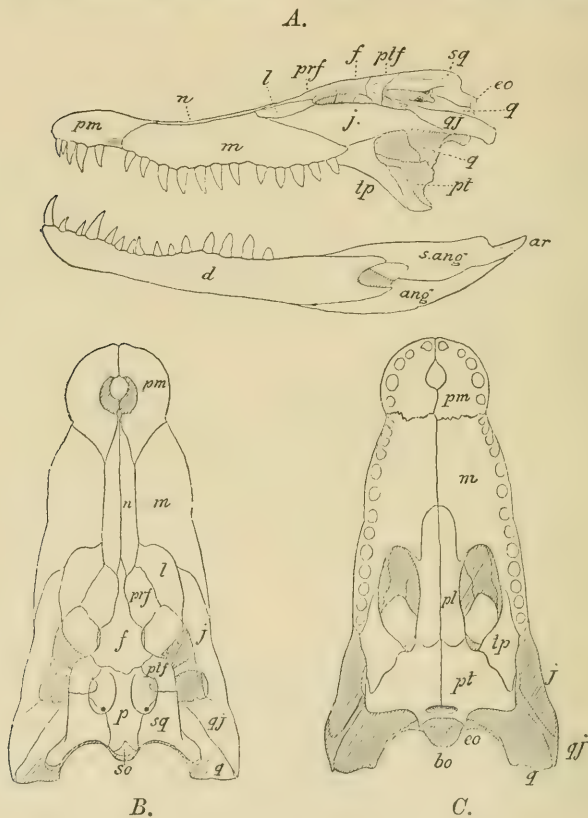


Fig. 1.—Skull of *Crocodilus palustris*.

- | | | |
|--------------------|-------------------|-----------------------|
| A. Side view. | B. Upper view. | C. Lower view. |
| ang. Angular. | m. Maxillary. | ptf. Postfrontal. |
| ar. Articular. | n. Nasal. | q. Quadrate. |
| bo. Basioccipital. | p. Parietal. | qj. Quadratojugal. |
| d. Dentary. | pl. Palatine. | s.ang. Supra-angular. |
| eo. Exoccipital. | pm. Præmaxillary. | so. Supraoccipital. |
| f. Frontal. | prf. Præfrontal. | sq. Squamosal. |
| j. Jugal. | pt. Pterygoid. | tp. Transpalatine. |
| l. Lachrymal. | | |

uncinate processes. Manus with five well-developed digits, pes with four. A dorsal armour of bony plates. Ears with moveable opercles. Pupil vertical.

Carnivorous, more or less aquatic Reptiles, laying hard-shelled, elongate eggs.

Of the six recent genera, two are represented in the Malay Peninsula:—

Nasal bones widely separated from the nasal aperture; splenial bones entering the mandibular symphysis, which extends to the 14th or 15th tooth; snout very narrow and elongate; $\frac{20-21}{18-19}$ teeth on each side.....

TOMISTOMA, p. 3.

Nasal bones entering the nasal aperture; splenial bones not entering the mandibular symphysis, which does not extend beyond the 8th tooth; snout broad and tapering; $\frac{16-19}{14-15}$ teeth on each side

CROCODILUS, p. 4.

Genus TOMISTOMA.

S. Müll. Arch. f. Nat. 1846, p. 122.

20 or 21 upper and 18 or 19 lower teeth on each side, the laterals received into interdental pits; fifth maxillary tooth largest; first and fourth mandibular teeth fitting into notches in the upper jaw. Snout very long and narrow; nasal bones not extending to the nasal opening, but in contact with the præmaxillaries; nasal opening smaller than the supratemporal fossæ; a small anterior bony plate in the upper eyelid. Mandibular symphysis very long, extending to the 14th or 15th tooth, comprising the splenial bones. A dorsal shield formed of four longitudinal series of juxtaposed, keeled, bony scutes.

A single species.

1. *Tomistoma schlegelii*.

Crocodilus (Gavialis) schlegelii, S. Müll. Tijdschr. v. Nat. en Physiol. v, p. 77, pl. iii (1838).

Tomistoma schlegelii, Gray, Tr. Z. S. vi, p. 134 (1867); Bouleng. Cat. Chelon. &c. p. 276 (1889); id. P. Z. S. 1896, p. 628; S. Flower, P. Z. S. 1899, p. 622; Butler, Journ. Fed. Malay States Mus. i, p. 1 (1905).

Malay name, *Buaya jenjulong*.

Snout 3 to $3\frac{1}{2}$ times as long as broad at the base. Nuchal and dorsal scutes forming a single continuous shield, composed of 22 transverse series, the broadest of which contains 6 scutes, the 4 anterior (nuchals) only two; two small postoccipital scutes. Fingers webbed at the base; outer toes extensively webbed. A strong crest on the outer edge of the leg. Scales on the limbs keeled. Dull olive-green above, finely and closely spotted with

dark brown; tail, and sometimes also back, with dark transverse bands; white beneath; iris yellowish brown.

Total length $4\frac{1}{2}$ metres (17 feet).

Borneo, Sumatra, Malay Peninsula.

The Malay Gharial was first discovered in the Malay Peninsula by Mr. Cecil Wray, on the Perak River, in 1889. A second specimen was caught in the Kinta River, near Batu Gajah, by Capt. H. C. Metcalfe, in 1893 or 1894. Others have since been observed in the States of Perak and Selangor, on the West coast, and of Pahang, on the East coast of the Peninsula. Skulls were observed by Dr. Annandale in a shrine in Patelung, one of the Eastern Siamese Malay States. A specimen from Pulau Tiga, Perak River, sent by Mr. L. Wray to the British Museum, measures 2.64 metres.

This is an essentially freshwater animal, and it is said by the natives to often frequent the swamps and marshy lands on the banks of rivers. It feeds principally on fish, and is not known to attack human beings.

Genus **CROCODYLUS.**

Laurenti, Syn. Rept. p. 53 (1768).

16 to 19 upper and 14 or 15 lower teeth on each side; fourth or fifth maxillary tooth largest; fourth mandibular tooth usually fitting into a notch in the upper jaw. Snout more or less elongate; nasal bones extending to the nasal opening, which is larger than the supratemporal fossæ; a very small anterior bony plate in the upper eyelid. Splenial bones not entering the mandibular symphysis, which does not extend beyond the eighth tooth (usually to the fourth or fifth). A dorsal shield formed of four or more longitudinal series of juxtaposed, keeled, bony scutes.

The species of this genus are spread over Africa, Southern Asia, the northern parts of Australasia, and Tropical America.

Two species are dealt with here:—

Snout (the portion of the head in front of the orbits)

$1\frac{3}{4}$ to $2\frac{1}{4}$ times as long as broad, with a more or less strong ridge on each side in front of the eye; postoccipital scutes usually absent

C. porosus, p. 4.

Snout $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as broad, without ridges; four small scutes in a transverse series between the occiput and the nuchal scutes.

C. palustris, p. 5.

1. *Crocodylus porosus.*

Schneid. Hist. Amph. ii, p. 159 (1801); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 622 (1847); Günth. Rept. Brit. Ind. p. 62 (1864); Bouleng. Cat. Chelon. &c. p. 284 (1889); id. Faun. Brit. Ind., Rept. p. 4 (1890); S. Flower, P. Z. S. 1899, p. 623; Annandale, Fascic. Malay., Zool. i, p. 147 (1903).

Crocodylus vulgaris, part., Cantor, t. c. p. 621.

Malay names. *Buaya*; *buaya tembaga* ("brass-coloured crocodile"), alluding to juvenile specimens.

Snout $1\frac{2}{3}$ to $2\frac{1}{2}$ times as long as broad at the base, with a more or less strong ridge on each side in front of the eye, slightly converging towards its fellow. Four large nuchal scutes forming a square, with one or two smaller ones on each side; postoccipital scutes usually absent, sometimes small and irregular. Dorsal shield well separated from the nuchal, the bony scutes forming 16 or 17 transverse and 4 to 8 longitudinal series, these scutes, in a transverse series, separated from each other by the leathery skin. Fingers webbed at the base; outer toes extensively webbed. A serrated fringe on the outer edge of the leg. Adult dark olive above; young pale olive, with large black spots on the body and tail, and dots on the head; yellow beneath.

Grows to a length of 30 feet.

India, Ceylon, Burma, and Southern China to North Australia and the Solomon and Fiji Islands. Entering salt water and frequently occurring out at sea. Exceedingly numerous in every suitable locality in Malaya. Every year many people lose their lives in the Peninsula by being seized and carried off by Crocodiles. Commonest among the mangroves of the coast, and therefore much rarer on the east side of the Peninsula, where the shores are mainly sandy. Does not extend to the upper reaches of the rivers, where the water is clear and swift, but travels overland for considerable distances to occupy small ponds and lakes or deserted mining holes, where it frequently attains a large size.

The largest specimen on record in the Peninsula is one obtained in salt water near Matang, Perak, which measured 24 feet $1\frac{1}{2}$ inches. A dorsal strip of its skin is now in the Perak Museum, Taiping.

A good account of the methods employed by Malays in the capture of this reptile is given by W. T. Hornaday ('Two Years in the Jungle,' pp. 305-307: New York, 1897).

23. *Crocodilus palustris*.

Lesson, in Bélanger, Voy. Ind. Or., Zool. p. 305 (1834); Günth. Rept. Brit. Ind. p. 61, pl. viii, fig. A (1864); Boulenger, Cat. Chelon. &c. p. 285 (1889); id. Faun. Brit. Ind., Rept. p. 5 (1890); S. Flower, P. Z. S. 1899, p. 625.

Crocodilus vulgaris, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 621 (1847).

Malay name, ? *Buaya katak* = "toad crocodile."

Snout $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as broad, without ridges. Four large nuchals forming a square, with a smaller one on each side; two pairs of smaller scutes in a transverse series behind the occiput (postoccipitals). Dorsal shield well separated from the nuchal, the scutes usually in 4, rarely in 6, longitudinal series, these scutes, in a transverse series, suturally united to each other. Fingers webbed at the base, outer toes extensively webbed. A

serrated fringe on the outer edge of the leg. Adult blackish olive above; young pale olive, dotted and spotted with black.

Grows to a length of 15 feet, or more.

India, Ceylon, Burma, Malay Peninsula and Archipelago.

The Marsh-Crocodile or Mugger appears to be rare in the Malay Peninsula. It is recorded by Cantor, and a specimen stated to be from Singapore is preserved in the British Museum.

It is, however, rather doubtful if Cantor's remarks really refer to this species, and not to *C. porosus*. No one of the local Museums possesses specimens.

Order CHELONIA.

Quadrate bone immovably united to cranial arches. Dorsal ribs single-headed, the anterior attached between two vertebræ. Body encased in a bony shell. A plastron formed of a small number of elements in addition to the clavicles. No sternum.

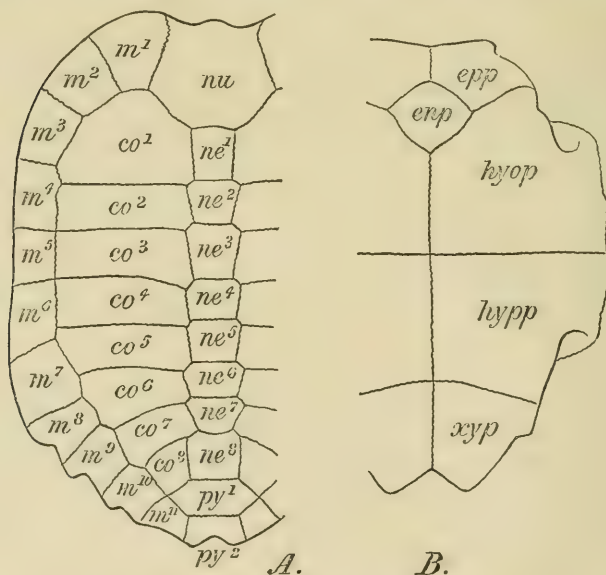


Fig. 2.—Shell of *Bellia crassicollis*, showing bony plates.

A. Carapace.

B. Plastron.

co. Costal.

enp. Entoplastron (Inter-

clavicle).

epp. Epiplastron (Clavicle).

hyop. Hyoplastron.

hypp. Hypoplastron.

m. Marginal.

ne. Neural.

nu. Nuchal.

py. Pygal.

xyp. Xiphiplastron.

No teeth; jaws covered with horny sheaths. Vent round or longitudinal; copulatory organ present, single.

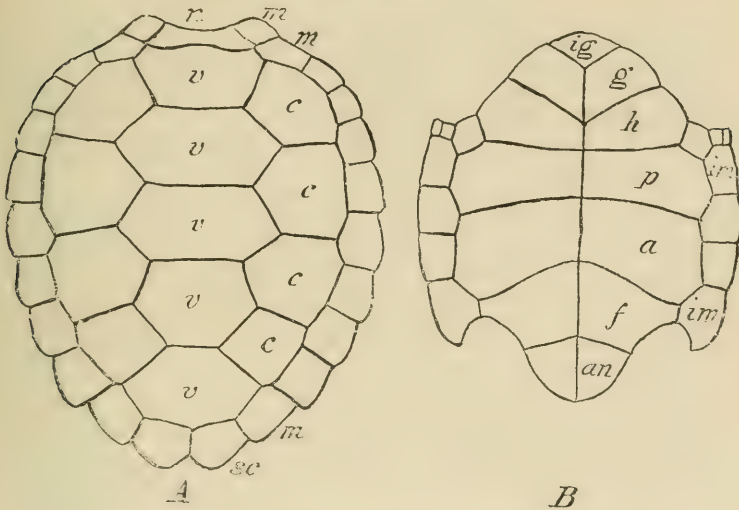


Fig. 3.—Shell of *Chelone mydas*, with epidermal horny shields.

A. Carapace.

B. Plastron.

a. Abdominal.
an. Anal.
c. Costal.
f. Femoral.
g. Gular.

h. Humeral.
ig. Intergular.
im. Inframarginal.
m. Marginal.

n. Nuchal.
p. Pectoral.
sc. Supracaudal.
v. Vertebral.

The anterior inframarginal is also termed *axillary*, and the posterior *inguinal*.

The Tortoises and Turtles of the Malay Peninsula are referred to four families:—

Carapace and plastron without epidermal shields, covered with a soft skin; limbs with three claws
Carapace and plastron covered with epidermal, horny shields; limbs with four or five claws .
Carapace and plastron covered with epidermal, horny shields; limbs paddle-shaped, with one or two claws
Carapace formed of mosaic-like small bony plates, separated from the vertebræ and ribs; limbs paddle-shaped, without claws

Trionychidæ, p. 8.

Testudinidæ, p. 12.

Chelonidæ, p. 27.

Sphargidæ, p. 30.

Family TRIONYCHIDÆ.

- Carapace and plastron without epidermal shields, covered with skin; marginal bones absent or forming an incomplete series, not connected with the ribs; epiplastra separated from the hyoplastra by a Λ -shaped entoplastron. Jaws concealed under fleshy lips; snout ending in a proboscis. Ear hidden. Head and neck completely retractile. Only the three inner digits clawed.

Thoroughly aquatic, carnivorous Turtles inhabiting Eastern and Southern Asia, Africa, and North America. Their ferocious habits, together with the extreme rapidity with which they project their necks, render the larger individuals dangerous to men bathing. Relished as food by the Chinese.

This family is represented in the Malay Peninsula by two closely related genera:—

- Postorbital arch narrower than the orbit, which is nearer the temporal than the nasal fossa TRIONYX, p. 8.
 Postorbital arch broad, the orbit nearer the nasal than the temporal fossa; proboscis very short .. PELOCHELYS, p. 11.

Genus TRIONYX.

Geoffr. Ann. du Mus. xiv, p. 1 (1809).

Plastron without cutaneous valves, the limbs remaining completely exposed; dorsal disk without marginal ossifications. Bony choanæ between the orbits; jaws strong; postorbital arch narrower than the diameter of the orbit. Tail very short.

Eastern and Southern Asia, Africa, North America.

Eggs spherical, hard-shelled.

Malay generic name, *Labi-labi*.

Synopsis of the Species.

- I. All the costal plates separated on the median line by the neural plates; disk longer than broad; plastral rugosities scarcely developed; head very large; young without or with small ocellar spots *T. subplanus*, p. 9.
 - II. Last pair of costal plates in contact on the median line; head moderately large; no dark vertebral stripe.
- Two neural plates between the first pair of costals; plastral callosities very large in the adult; alveolar surface of lower jaw flat or with a longitudinal furrow at the symphysis; olive-brown beneath, young with 4 or 6 large ocellar spots on the back *T. hurum*, p. 9.

- A single neural plate between the first pair of costals; plastral callosities very feebly developed; alveolar surface of lower jaw with a strong longitudinal ridge at the symphysis; white beneath *T. phayrii*, p. 10.
- A single neural plate between the first pair of costals; plastral callosities well developed; alveolar surface of lower jaw with a strong longitudinal ridge at the symphysis; white beneath, young without ocellar spots *T. cartilagineus*, [p. 11.]

4. *Trionyx subplanus*.

Geoffr. Ann. Mus. xiv, p. 11, pl. v, fig. 2 (1809); Günth. Rept. Brit. Ind. p. 49 (1864); Bouleng. Cat. Chelon. p. 246 (1889); id. Faun. Brit. Ind., Rept. p. 11 (1890); S. Flower, P. Z. S. 1899, p. 619.

Disk very flat and longer than broad; all the costal plates separated on the median line by the neural plates; a single neural plate between the first pair of costals; a large fontanelle, till late in life, between the nuchal and dorsal plates. Epiplastra narrowly separated from each other in front of the entoplastron, which forms an obtuse or a right angle; plastral rugosities scarcely developed, on the hyo- and hypoplastra and on the xiphiplastra (these rugosities absent in the young). Dorsal skin of young with interrupted longitudinal ridges. Head very large; postorbital arch extremely narrow; mandibular symphysis without median ridge. Disk olive-brown or yellowish olive above, sometimes mottled all over with dark olive-brown; young with a blackish vertebral stripe and four or six small ocellar spots, a dark oblique streak behind each eye, and a **A**-shaped dark marking between and behind the eyes; lower parts pale lemon-yellow.

Length of disk 250 millim.

Mergui, Malay Peninsula, Sumatra, Borneo, Java, Philippines. Recorded from Penang and Singapore, and there are examples in the Selangor Museum from Terutau Island, north of Penang, and from Tioman, off the coast of Pahang. A young specimen from Gunong Pulau, Johore, has been referred to *T. phayrii* by Flower.

5. *Trionyx hurum*.

Gray, Syn. Rept. p. 47, pl. x (1831); Bouleng. Cat. Chelon. p. 249 (1889); id. Faun. Brit. Ind., Rept. p. 13 (1890).

Gymnopus gangeticus (non Cuv.), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 614 (1847).

Trionyx gangeticus, Günth. Rept. Brit. Ind. p. 47 (1864).

Disk not or but little longer than broad; last costal plate forming a suture with its fellow; two neural plates between the first pair of costals. Epiplastra narrowly separated from each other in front of the entoplastron, which forms an obtuse or a right angle; plastral callosities in the adult (hyo-hypoplastral, xiphiplastral, and in old specimens entoplastral), coarsely pitted

and vermiculate like the bones of the carapace. Dorsal skin of young with longitudinal ridges of small tubercles. Head moderate; postorbital arch somewhat more than half the diameter of the orbit in the adult; mandibular symphysis without median ridge. Olive-brown above and beneath; head, neck, limbs, and border of shell light-dotted; head with large yellow spots, viz. across the

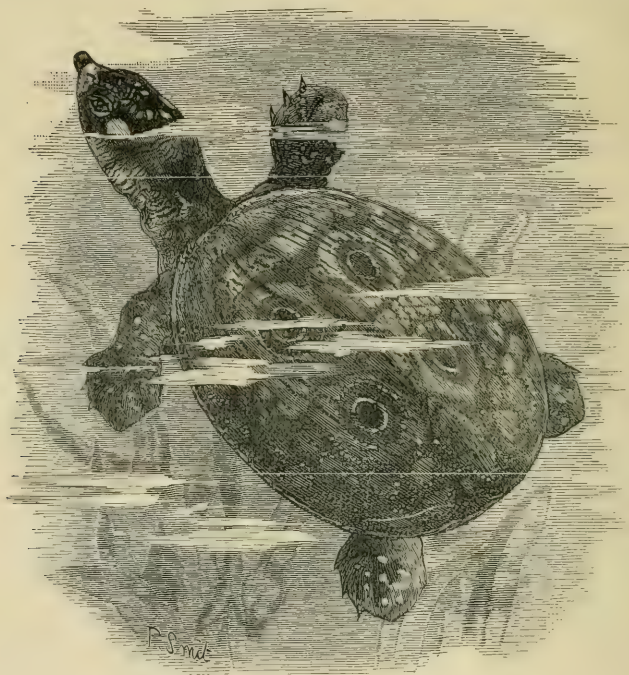


Fig. 4.—*Trionyx hurum* (young).

snout, behind the orbit, at the angle of the mouth, and on the chin, these markings becoming indistinct in the adult, the head of which is more or less closely spotted or vermiculated with black; dorsal disk in the young with dark marblings and four or six very large ocellar markings.

Length of disk 400 millim.

Bengal. Recorded from Penang by Cantor.

6. *Trionyx phayrii*.

Theobald, Journ. Linn. Soc. x, 1868, p. 18; Anders. Journ. Asiat. Soc. Bengal, p. 30 (1871); Bouleng. Cat. Chelon. p. 251 (1889); id. Faun. Brit. Ind., Rept. p. 14 (1890).

Similar to *T. hurum*, but a single neural plate between the first

pair of costals, plastral callosities hardly developed, and mandibular symphysis with a median ridge. Lower parts white.

Length of disk 500 millim.

Burma, Malay Peninsula, Sumatra, Borneo, Java.

Recorded from Penang by Anderson.

7. *Trionyx cartilagineus*.

Testudo cartilaginea, Boddaert, Epistola ad W. Roëll, 1770.

Gymnopus cartilaginea, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 615 (1847).

Trionyx ornatus, Gray, P. Z. S. 1861, p. 41, pl. v; Günth. Rept. Brit. Ind. p. 48, pl. vi, fig. B (1864).

Trionyx cartilagineus, Bouleng. Cat. Chelon. p. 253 (1889); id. Faun. Brit. Ind., Rept. p. 15 (1890); S. Flower, P. Z. S. 1899, p. 620.

Disk not or but little longer than broad; last costal plate forming a suture with its fellow; a single neural plate between the first pair of costals. Epiplastra in contact, or narrowly separated, in front of the entoplastron, which forms an obtuse or a right angle; plastral callosities well developed in the adult (hypo- and xiphiplastral), and coarsely sculptured like the bones of the carapace. Dorsal skin of young with longitudinal ridges of small tubercles. Head moderate; postorbital arch very narrow; mandibular symphysis with a strong median ridge. Olive-brown above and on the chin; head and chin with numerous yellow spots, the largest of which are below the temple; dorsal disk of young light-dotted, usually with a few large blackish spots, or with a black transverse band.

Length of disk 500 millim. A specimen from Kuala Lumpur measures 605 in length and 565 in breadth over the curves of the bony carapace.

Burma and Cochin China to the Malay Peninsula and Archipelago.

Very common in slow-flowing and muddy rivers and estuaries and in ponds and swamps, and attaining a very large size. Apparently the commonest *Trionyx* in the Malay Peninsula. Although chiefly carnivorous, will feed on rice in captivity.

Genus PELOCHELYS.

Gray, P. Z. S. 1864, p. 89.

Like *Trionyx*, but jaws weaker, postorbital arch broader, as broad as the diameter of the orbit, and proboscis very short.

A single species.

8. *Pelochelys cantoris*.

Chitra indica, part., Gray, Cat. Tort. p. 49 (1844); Günth. Rept.

Brit. Ind. p. 50, pl. vi, fig. C (1864).

Gymnopus indicus (non Gray), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 616 (1847).

Pelochelys cantorii, Gray, P. Z. S. 1864, p. 90, figs.; Bouleng. Cat. Chelon. p. 263 (1889); id. Faun. Brit. Ind., Rept. p. 15 (1890); S. Flower, P. Z. S. 1899, p. 621.

Malay name, *Labi-labi*.

Disk not or but little longer than broad; last costal plate forming a suture with its fellow; a single neural plate between the first pair of costals. Epiplastra small and widely separated from each other; entoplastron forming a right or an acute angle; plastral callosities largely developed in the adult. Dorsal skin of young tuberculate. Head moderate; snout very short and broad. Olive above, uniform or spotted with darker; lips and throat of young olive, speckled with whitish or yellow; ventral region white.

Length of disk 940 millim.

From Bengal and China to the Malay Peninsula and Archipelago and New Guinea. Specimens are in the local museums from the coasts of Perak and Selangor, and are not unfrequently caught on lines of hooks set for sharks and rays.

According to Cantor this turtle occurs in estuaries and on the sea-coast. At Penang it is frequently taken in the fishing-stakes. It is very powerful, and of ferocious habits.

Family TESTUDINIDÆ.

Shell covered with epidermal, horny shields; the neural and costal plates bordered by a series of marginals. Plastron large, with an entoplastron of rhomboidal shape, and the epiplastra in contact with the hyoplastra. Parietal bones widely separated from the squamosals. Ear distinct. Head and neck completely retractile. Digits short or moderately elongate; phalanges with condyles; claws four or five.

Terrestrial or aquatic Tortoises, distributed over every part of the world except Australia. Eggs spherical or oval, hard-shelled.

Synopsis of the Genera.

- I. Limbs club-shaped; alveolar surface of upper jaw with a median ridge TESTUDO, p. 13.
- II. Digits distinct, with at least a rudiment of web; alveolar surface of upper jaw without median ridge.
 - A. Alveolar surface of jaws moderately broad; choanæ between the eyes.

Plastron united to the carapace by suture, immovable; [p. 16.
no bony temporal arch GEOEMYDA,

- Plastron connected with the carapace by a ligamentous hinge; a bony temporal arch [p. 18. CYCLEMYS,
- Plastron united to the carapace by suture, immovable; a bony temporal arch BELLIA, p. 22.
- B. Alveolar surface of jaws very broad; choanæ behind the level of the eyes DAMONIA, p. 23.
- III. Digits distinct, entirely webbed; alveolar surface of upper jaw with one or two median ridges.
- A. Choanæ between the eyes; alveolar surface of upper jaw with a single median ridge; fore limb with five claws.
- Edge of jaws not denticulated; skin of hinder part of head divided into small shields ORLITIA, p. 24.
- Edge of jaws denticulated; skin of upper surface of head not divided into shields [p. 25. CALLAGUR,
- B. Choanæ behind the level of the eyes; alveolar surface of upper jaw with two ridges; fore limb with four claws only BATAGUR, p. 26.

Genus **TESTUDO**.

Linn. Syst. Nat. i, p. 350 (1766).

Neural plates usually alternately tetragonal and octagonal; costal plates alternately narrower and wider. Plastron extensively united to the carapace by suture, with short axillary and inguinal

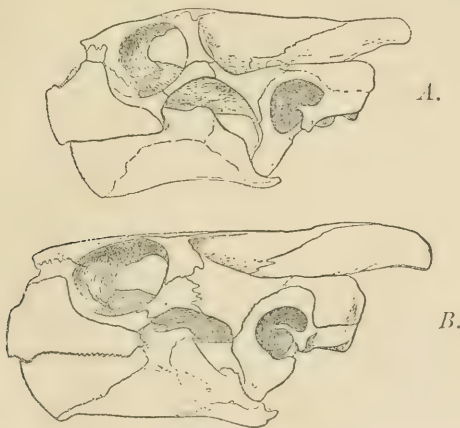


Fig. 5.—Skulls of *Testudo latouchalis* (A) and *T. emys* (B).
(From Fascic. Malay., Zool.)

buttresses, which do not reach, or just reach, the costal plates; entoplastron anterior to the humero-pectoral suture. Skull with

weak or moderately broad postorbital and temporal arches; alveolar surface of upper jaw with one or two median ridges; choanæ between the eyes. Head with horny shields above. Limbs club-shaped, covered with large scales or tubercles. Tail short.

Represented in every part of the world except Australasia.

Habits terrestrial and herbivorous.

All the Malayan species are inhabitants of dry hill jungle, but are by no means abundant.

Malay name, *Baning* (generic) or *kura-kura*.

Synopsis of the Species.

- | | |
|--|-------------------------------------|
| Supracaudal shield single, more or less incurved;
no enlarged tubercles on the thighs | <i>T. elongata</i> , p. 14. |
| Two supracaudal shields, embracing a deep notch;
antero-lateral border of second and third vertebral shields not or but slightly shorter than postero-lateral | <i>T. emys</i> , p. 15. |
| Two supracaudal shields, embracing a deep notch;
antero-lateral border of second and third vertebral shields much shorter than postero-lateral. | [p. 15.
<i>T. latinuchalis</i> , |

9. *Testudo elongata*.

Blyth, Journ. Asiatic Soc. Bengal, xxii, p. 639 (1853); Günth. Rept. Brit. Ind. p. 8 (1864); Bouleng. Cat. Chelon. p. 173 (1889); id. Faun. Brit. Ind., Rept. p. 20 (1890); S. Flower, P. Z. S. 1899, p. 616; Bouleng. Fascic. Malay., Zool. i, p. 147 (1903).

Shell considerably depressed, more than twice as long as deep in the adult, with flat vertebral region; anterior and posterior margins slightly reverted, strongly serrated in the young, feebly in old specimens; shields concentrically striated, except in old specimens; nuchal present (rarely absent), narrow and elongate; supracaudal undivided, more or less incurved; second and third vertebrals broader than long and nearly as broad as the costals. Plastron large, truncate anteriorly, deeply notched posteriorly; suture between the pectoral shields as long as or longer than that between the humerals; anal shields forming a very short suture, or entirely separated by the anal notch; axillary and inguinal moderate. Head moderate; a pair of large prefrontal shields, usually followed by a nearly equally large frontal; beak feebly hooked, tricuspid; alveolar ridge of upper jaw short and rather feeble. Anterior side of fore limbs with moderate, unequal-sized, imbricate scales; no enlarged tubercles on the thighs. Tail ending in a claw-like horny tubercle. Carapace and plastron pale yellowish brown or greenish yellow, each shield with an irregular black spot or blotch, which may occupy its greater portion, or may be much broken up or indistinct; head and neck pale green.

Length of shell 270 millim.

Bengal, Assam, Burma, Cochinchina, Siam, Camboja, Malay Peninsula (Penang and Kampong Jalor).

Called by the Jalor natives *Kura-kura mas* or "gold tortoise."

10. *Testudo emys*.

Schleg. & Müll. in Temminck, Verh. Nat. Nederl. Ind., Rept. p. 34, pl. iv (1844); Bouleng. Cat. Chelon. p. 158 (1889); id. Faun. Brit. Ind., Rept. p. 22 (1890); S. Flower, P. Z. S. 1899, p. 616.
Geoemyda spinosa, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 607 (1847).

Manouria emys, Günth. Rept. Brit. Ind. p. 10 (1864).

Shell considerably depressed, its depth not half its length; anterior and posterior margins reverted, more or less strongly serrated; nuchal present, not or but little broader than long; supracaudal shields two; discal shields concentrically striated, often concave; vertebrals much broader than long and at least as broad as costals, the second and third with the antero-lateral side not or but little shorter than the postero-lateral. Plastron large, gular region somewhat produced and usually notched, hind lobe deeply notched; the pectoral shields usually separated from each other; axillary shield very small, inguinal large. Head moderate; temporal arch broad; two large præfrontal shields and a large frontal; jaws not hooked, feebly denticulate, the alveolar surface of the upper jaw with a strong median ridge. Fore limb anteriorly with very large, bony, pointed, imbricate tubercles; hind limb with large, bony tubercles on the plantar surface, with others larger, conical, and spur-like on the heel and on the back of the thigh. Adult dark brown or blackish; carapace of young yellowish brown, with dark brown markings.

Length of shell 520 millim. One of the largest tortoises.

Burma, Siam, Malay Peninsula, Sumatra, Borneo.

Has been observed in Penang, the Larut Hills, and the Dindings.

Called *Baning* or *kura kura anam kaki* or "six-footed tortoise," referring to the femoral spur. Lives in the drier parts of the woods.

11. *Testudo latinuchalis*.

Geoemyda latinuchalis, Vaill. Bull. Soc. Philom. (8) vi, p. 68 (1894).
Testudo pseudemys, Bouleng. Fascic. Malay., Zool. i, p. 144, pl. ix (1903); Annandale, Proc. Asiat. Soc. Bengal (2) ii, p. 204 (1906).
Testudo latinuchalis, Siebenr. Zool. Jahrb., Suppl. x, p. 520 (1909).

Shell considerably depressed, its depth not half its length; anterior and posterior margins reverted and strongly serrated; nuchal shield present, rather large, broader than long; supracaudal shields two, embracing a deep notch; discal shields concentrically striated and more or less concave; vertebrals much broader than long, at least as broad as the costals, the second,

third, and fourth with the antero-lateral side not half as long as the postero-lateral. Plastron large, gular region more or less produced and notched, hind lobe deeply notched; pectoral shields meeting on the median line; axillary shield very small, inguinal large. Head rather small; temporal arch narrow, slender; two large prefrontal shields and a large frontal; jaws not hooked, the alveolar surface of the upper jaw with a feeble median ridge. Limbs with very large, bony, imbricate tubercles, which, on the front of the fore limb and on the heel, are pointed and spine-like; a group of bony tubercles on the back of the thigh, the central ones very large and conical. Tail of male ending in a divided, claw-like tubercle. Yellowish or pale brown, dark brown or blackish on the periphery of the dorsal shield and on the anterior border of the marginals; young with the carapace speckled with blackish; plastron yellow or brown and yellow; head and limbs yellow, more or less variegated with dark brown.

Length of shell 255 millim.

Cochinchina, Burma, Malay Peninsula (Perak, Selangor, and Pabang).

Apparently found at higher elevations than *T. emys*.

This species was first described from a shell referred to *Geoemyda* *. The types of *T. pseudemys* are from the Batang Padang district, S. Perak, 1000–2000 feet. I have also examined a specimen from the Larut Hills, 4000 feet. Dr. Annandale observes of the Batang Padang specimens:—"Taken on a jungle patch at dusk, within a few yards of one another. When alarmed they draw in their head, but when lifted from the ground they become very vicious, hissing, stretching out their necks, and attempting vigorously to bite, their whole demeanour differing from that of specimens of *T. emys* I have seen in captivity in the Malay Peninsula."

Genus **GEOEMYDA**.

Gray, P. Z. S. 1834, p. 100.

Neural plates mostly hexagonal, postero-lateral margins shorter than antero-lateral. Plastron united to the carapace by suture, with axillary and inguinal peduncles just reaching first and fifth costal plates; humero-pectoral suture extending across entoplastron. Skull without bony temporal arch; alveolar surface narrow, without median ridge. Upper surface of head covered with undivided skin. Digits with a short web. Tail very short.

Burma, Malay Peninsula and Archipelago.

Habits terrestrial or semiaquatic; chiefly herbivorous.

* I am indebted to Dr. Pellegrin for further notes on this specimen, which confirm the identification made by Dr. Siebenrock.

Two species in the Malay Peninsula:—

- Anterior margin of shell serrated; second vertebral shield at least as broad as the second costal, much broader than long *G. spinosa*, p. 17.
 Anterior margin of shell not serrated; second vertebral shield narrower than the second costal, not much broader than long *G. grandis*, p. 18.

12. *Geoemyda spinosa*.

Emys spinosa, Gray, Syn. Rept. p. 20 (1831).

Geoemyda spinosa, Gray, P. Z. S. 1834, p. 100; Günth. Rept. Brit. Ind. p. 18 (1864); Bouleng. Cat. Chelon. p. 137 (1889); id. Faun. Brit. Ind., Rept. p. 25 (1890); S. Flower, P. Z. S. 1899, p. 614; Ridley, Journ. Straits Branch Roy. Asiat. Soc. No. 32, p. 185 (1899); Boulenger, Fascic. Malay., Zool. i, p. 144 (1903).

Geoemyda spinosa, part., Cantor, Journ. Asiat. Soc. Bengal, xvi p. 607 (1847).

Carapace of adult much depressed, with broad flat vertebral region and an uninterrupted obtuse keel, anterior and posterior margins serrated; of young more regularly arched, with a short keel or spinose tubercle on each costal shield, and the border strongly serrated all round, each marginal shield being produced into a spine, with or without smaller denticulations on each side, the vertebral keel stronger than in the adult. Vertebral shields (2 to 4) much broader than long, at least as broad as the costals; nuchal shield longer than broad. Plastron large; the width of the bridge about equals the length of the posterior lobe, which is angularly emarginate; suture between the abdominal shields not or but slightly longer than that between the pectorals; axillary and inguinal shields present. Upper jaw bicuspid. Carapace brown above, reddish in the young, the vertebral keel lighter; each plastral shield with yellow and dark brown radiating streaks; soft parts dark brown, with a yellowish spot on each side of the neck, near the ear; head and limbs with small scarlet spots in living specimens.

Length of shell 200 millim.

Tenasserim, Sumatra, Borneo, and Malay Peninsula, where it is of very general distribution, though, according to Flower, this tortoise is found in jungle-streams apparently only in the hills, in Penang and Perak at elevations of two or three thousand feet above the sea, while in Singapore it is found on Bukit Timah at less than 500 feet. Lives day and night in the water and feeds on fruit and vegetables.

13. *Geoemyda grandis*.

Gray, Ann. & Mag. Nat. Hist. (3) vi, p. 218 (1860); Günth. Rept. Brit. Ind. p. 19, pls. i & ii, figs. A & B (1864); Bouleng. Cat. Chelon. p. 138 (1889); id. Faun. Brit. Ind., Rept. p. 25 (1890); S. Flower, P. Z. S. 1899, p. 615.

Carapace arched or tectiform, not flattened on the vertebral

region, which bears a strong but obtuse keel; only the posterior margin serrated. Vertebral shields (1 to 3) not or but slightly broader than long and narrower than the costals; nuchal longer than broad. Plastron similar to that of *G. spinosa*; the length of the suture between the pectoral shields at least two thirds that of the abdominals. Dark brown or blackish above, plastron and lower surface of marginals with black and yellow rays, either the black or the yellow predominating.

Length of shell 400 millim.

Burma, Siam, Camboja, Malay Peninsula (Penang, Prov. Wellesley, Kedah).

Genus **CYCLEMYS**

Bell, P. Z. S. 1834, p. 117.

Neural plates mostly hexagonal, posterior lateral margins shortest. Plastron united to carapace by ligament, with a more or less distinct hinge between hyo- and hypoplastral bones; humero-pectoral suture crossing the entoplastron. Skull with a bony temporal arch; alveolar surfaces without median ridge; choane between the eyes. Greater part of upper surface of head covered with undivided skin. Digits more or less webbed. Tail short.

Distributed over the greater part of the Oriental region, east of the Bay of Bengal. Terrestrial or semiaquatic; chiefly herbivorous.

Synopsis of the Species.

- I. Plastron notched posteriorly; posterior margin of carapace serrated, especially in the young; carapace unicarinate in the young.
 - A. Suture between pectoral shield and marginals longer than that between abdominal and marginals.
 - 6 or 7 vertebral shields; upper jaw hooked, bicuspid, not denticulate *C. platynota*, p. 18.
 - 5 (rarely 6) vertebral shields; upper jaw strongly hooked, bicuspid, denticulate. . . . *C. annandali*, p. 19.
 - B. Suture between pectoral and marginals shorter than that between abdominal and marginals *C. dhor*, p. 20.
- II. Plastron not notched posteriorly; carapace tricarinate in the young, posterior margin not serrated *C. amboinensis*, p. 21.

14. **Cyclemys platynota.**

Emys platynota, Gray, P. Z. S. 1834, p. 54; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 609 (1847).

Notochelys platynota, Günth. Rept. Brit. Ind. p. 17 (1864).

Cyclemys platynota, Bouleng. Cat. Chelon. p. 130 (1889); id. Faun. Brit. Ind., Rept. p. 30 (1890); S. Flower, P. Z. S. 1899, p. 612; Ridley, Journ. Straits Branch Roy. Asiat. Soc. No. 32, p. 186 (1899); Bouleng. Fascic. Malay., Zool. i, p. 142 (1903).

Carapace depressed, angular, the vertebral region flat, with an interrupted obtuse keel; posterior margin serrated; six, rarely seven, vertebral shields; vertebrals (except the first) much broader than long, at least as broad as costals. Plastron narrower than the opening of the shell, with the hind lobe openly emarginate, connected with the carapace by a distinct bridge, the width of which is contained $2\frac{1}{2}$ to $2\frac{2}{3}$ times in the length of the plastron; no distinct transverse hinge; a large inguinal shield; the suture between the pectoral shield and the marginals longer than that between the abdominal and the marginals; the suture between the pectoral shields as long as or a little shorter than that between the abdominals. Upper jaw hooked, the hook bicuspid, divided by a median groove. Digits extensively webbed; claws long, curved, sharp. Front part of arm with broad band-like shields. Carapace reddish brown, or yellowish brown with radiating brown lines; young with a pair of round black spots on each vertebral shield, and one or two similar spots on each costal; plastron yellow, with brown spots, or brown with the sutures between the shields yellow. Head yellowish brown; neck brown, with irregular yellowish streaks, the broadest of which extends from the posterior corner of the eye.

Length of shell 330 millim.

Mergui, Malay Peninsula, Sumatra, Borneo. Observed in Penang, Singapore, Perak, Selangor, Johore, and Jalor.

In captivity, according to Capt. Flower, it spends all its time by preference in shallow water, and feeds on almost any vegetable, preferring fruit. It is regarded as the most active and intelligent of the Malay tortoises. Two of them have been observed to attack a big water-snake (*Acrochordus javanicus*).

Capt. Flower (*l. c.* p. 613) mentions a variety, differing in the number (5) of vertebral shields, in the general shape of the carapace, and in the colour of the head. This supposed variety is a distinct species, *C. dhor*.

15. *Cyclemys annandalii*.

Bouleng. Fascic. Malay., Zool. i, p. 142, pls. vii & viii (1903).

Carapace depressed, unicarinate, the keel merely indicated on the fourth and fifth vertebral shields in the adult; posterior margin strongly serrated in the young, feebly in the adult; five, rarely six, vertebral shields, which are not broader than long and much narrower than the costals in the adult. Plastron narrower than the opening of the shell, with the hind lobe openly emarginate, connected with the carapace by a distinct bridge, the width of which is contained $2\frac{1}{2}$ times in the length of the plastron;

no transverse hinge; axillary and inguinal shields large; the suture between the pectoral shield and the marginals longer than that between the abdominal and the marginals; the suture between the pectoral shields as long as or a little shorter than that between the abdominals, the suture between the humerals shorter than that between the gulars, and that between the anals shorter than that between the femorals. Upper jaw hooked, the hook very strongly bicuspid in the adult, and with a very distinct denticulation along the whole border. Digits extensively webbed; claws long, curved, sharp. Front part of the arm with broad

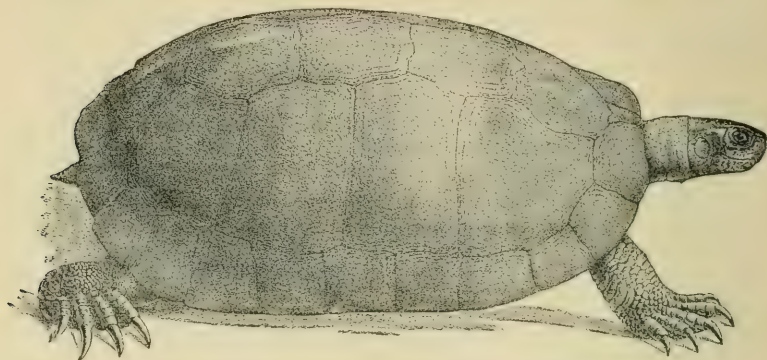


Fig. 6.—*Cyclemys annandalii*. (From Fascic. Malay., Zool.)

band-like shields. Carapace dark brown, spotted with black in the young, black in the adult; plastron of young yellowish, with symmetrical dark brown markings, of adult black, with yellow markings. Head and neck, in the young, dark brown, with a yellowish streak on each side from the upper surface of the snout to the neck, passing above the eye and the tympanum, parallel with another on the temple and neck; in the adult, blackish, vermiculate with yellowish, but without light streaks.

Length of shell 380 millim.

The types of this species, obtained at Kampong Jalor, Siamese Malay States, were brought to Messrs. Annandale and Robinson by natives, who frequently keep this tortoise in captivity. The adults appear to be largely terrestrial in habits, but it is probable that the young are more aquatic.

16. *Cyclemys dhor*.

Emys dhor, Gray, Syn. Rept. p. 20 (1831).

Cyclemys oldhami, Gray, P. Z. S. 1863, p. 178; Günth. Rept. Brit. Ind. p. 15, pl. v, fig. B (1864).

Cyclemys dhor, Bouleng. Cat. Chelon. p. 131 (1889); id. Faun. Brit. Ind., Rept. p. 30 (1890).

Carapace depressed, with a single obtuse keel; posterior margin

serrated; vertebral shields as broad as long or broader than long, narrower than the costals. Plastron narrower than the opening of the shell, with the hind lobe angularly notched, connected with the carapace by a distinct bridge, the width of which is contained $2\frac{3}{4}$ to 3 times in the length of the plastron; a transverse hinge between the hyo- and hypoplastral bones (which does not correspond with the curved suture between the pectoral and abdominal shields), developed in the adult only; a small inguinal shield may be present; suture between the pectoral shield and the marginals shorter than that between the abdominal and the marginals; the longest median suture is between the pectorals. Hook of upper jaw bicuspid. Digits distinctly webbed, with sharp claws. Front part of arm with broad transverse scales. Carapace brown, or yellowish brown spotted with dark brown; plastron yellowish or pale brown in the young, with dark brown spots or radiating lines, dark brown in the adult. Neck with dark and light longitudinal lines.

Length of shell 190 millim.

Northern India, Burma, Siam, Camboja, Malay Peninsula and Archipelago. A specimen was obtained at Kampong Jalor by Messrs. Annandale and Robinson. Specimens are in the Selangor Museum from the vicinity of Kuala Lumpur.

I have examined a young specimen from Ulu Legeh, Siamese Malay States, kindly submitted to me by Dr. Hanitsch, who had referred it to *Kachuga lineata* (Rep. Raffles Mus. 1897, p. 8).

17. *Cyclemys amboinensis*.

Testudo amboinensis, Daud. Hist. Rept. ii, p. 309 (1802).

Cistudo amboinensis, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 611 (1847).

Cuora amboinensis, Gray, Cat. Sh. Rept. i, p. 41 (1855); Günth. Rept. Brit. Ind. p. 12, pl. iv, figs. A, B (1864).

Cyclemys amboinensis, Bouleng. Cat. Chelon. p. 133 (1889); id. Faun. Brit. Ind., Rept. p. 31 (1890); S. Flower, P. Z. S. 1899, p. 614; Ridley, Journ. Straits Branch Roy. Asiat. Soc. No. 32, p. 186 (1899); Bouleng. Fascic. Malay., Zool. i, p. 142 (1903).

Carapace depressed and tricarinate in the young, usually very convex and without or with a single keel in adult females; vertebral shields as long as broad or a little longer than broad in the adult, broader in the young, much narrower than the costals. Plastron as large as the opening of the shell in the adult, without distinct bridge; no anal notch; the line of junction between the hypoplastron and the carapace shorter than that between the hypoplastron and the carapace; pectoral shields as long as the abdominals or shorter, as long as the humerals or slightly longer; axillary and inguinal shields small or absent. Head rather small; upper jaw scarcely hooked, without any emargination. Front part of arm with large transverse scales. Digits moderately webbed, with sharp claws. Carapace brown or blackish; plastron

yellow with large black spots, or dark brown with the sutures between the shields yellow; in the very young the black spots of the plastron are confluent into a broad median band, the border of the plastron being yellow; head and neck brown above, yellow beneath; a yellow band borders the head and neck above, meeting its fellow above the nostrils; a second yellow band passes through the eye and is separated from the upper jaw by a dark brown band; ear yellow.

Length of shell 200 millim.

Distributed from Burma and Siam to the Moluccas.

Known from Penang, Kedah, Jalor, Perak, Malacca, and Singapore.

Common in ponds, streams, and paddy-fields, especially in the low country. In captivity it feeds on vegetables, but prefers bananas, and will also eat flesh. Eggs rather large and oblong.

This species and *C. platynota* are the most commonly seen of the Malayan tortoises.

Genus **BELLIA**.

Gray, P. Z. S. 1869, p. 197.

Neural plates hexagonal, anterior lateral margins shortest. Plastron united to the carapace by suture, with long axillary and inguinal buttresses; humero-pectoral suture crossing the entoplastron. Skull with a bony temporal arch; alveolar surfaces without median ridge; choanæ between the eyes. Skin of hinder part of head only divided into small shields. Digits webbed. Tail short.

A single species. Aquatic and carnivorous.

18. *Bellia crassicolis*.

Emys crassicolis, Gray, Syn. Rept. p. 21 (1831); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 609 (1847); Günth. Rept. Brit. Ind. p. 28, pl. iv, fig. E (1864).

Bellia crassicolis, Gray, P. Z. S. 1869, p. 197; Bouleng. Cat. Chelon. p. 98 (1889); id. Faun. Brit. Ind., Rept. p. 32 (1890); S. Flower, P. Z. S. 1899, p. 611.

Carapace moderately depressed, tricarinate in the young, the keels, especially the laterals, becoming indistinct in old specimens; vertebral region flattened in the adult male; posterior border serrated; nuchal small, broader behind; posterior side of first vertebral not half the length of the shield in the adult; vertebrals 2 to 4 as long as broad or a little broader than long, much narrower than the costals, narrowly in contact with each other in old specimens; in the latter, the antero-lateral sides are convex, the postero-lateral longer and concave. Plastron smaller than the opening of the shell, truncate anteriorly, angularly notched posteriorly, feebly concave in the males, strongly angulate laterally in young specimens, feebly in old ones; the width of the bridge about equals the length of the hind lobe; abdominal shields usually forming the longest suture, humerals the shortest; axillary and

inguinal shields present. Head rather large; snout very short, not prominent; upper jaw not hooked. Digits webbed to the claws; front of forearm and outer side of leg with large band-like scales. Shell dark brown or black, plastron usually with yellowish variegations, or bands following the sutures of the shields, or with a broad band along each side. Soft parts dark brown or black; some large yellow spots on the head, becoming indistinct in old specimens.

Length of shell 170 millim.

Tenasserim, Siam, Malay Peninsula, Sumatra, Borneo.

Common in small freshwater streams and ponds in Penang and Kedah. Feeds on frogs, shell-fish, and animal offal.

Genus **DAMONIA**.

Gray, P. Z. S. 1869, p. 193.

Neural plates hexagonal, anterior lateral margins shortest. Plastron united to the carapace by suture, with long axillary and inguinal buttresses; humero-pectoral suture crossing the entoplastron. Skull with a bony temporal arch; alveolar surfaces very broad, without median ridge; choanæ behind the level of the eyes. Skin of hinder part of head only divided into small shields. Digits webbed. Tail short.

China, Japan, and India to Malay Peninsula and Archipelago.

Aquatic and carnivorous.

A single species in the Malay Peninsula.

19. *Damonia subtrijuga*.

Emys subtrijuga, Schleg. & Müll. in Temminck, Verh. Nat. Nederl. Ind. p. 30 (1844).

Emys macrocephala, Günth. Rept. Brit. Ind. p. 31 (1864).

Damonia subtrijuga, Bouleng. Cat. Chelon. p. 94 (1889); S. Flower, P. Z. S. 1899, p. 610; Bouleng. Fascic. Malay., Zool. i, p. 142 (1903).

Carapace depressed, tricarinate, the lateral keels not extending to the fourth costal shields; posterior border not serrated; nuchal moderate, broader behind; vertebrals 2 to 4 a little broader than long, much narrower than the costals. Plastron smaller than the opening of the shell, flat in both sexes, angulate laterally, truncate anteriorly, angularly notched posteriorly; the width of the bridge nearly equals the length of the hind lobe; the longest median suture between the abdominal shields; axillary and inguinal shields present. Head very large; snout projecting; upper jaw emarginate mesially. Digits webbed to the claws. Shell brown above, with a more or less distinct black spot on each shield, yellow beneath, each plastral shield with a large black blotch. Soft parts dark brown; a yellow streak from the end of the snout to the temple, following the canthus rostralis and the supraorbital edge;

another from the loreal region to the angle of the mouth; two or four vertical yellow streaks below the nostrils; a V- or Y-shaped yellow marking on each side of the mandible; sides of neck with yellow streaks; limbs with yellow markings.

Length of shell 200 millim.

Cochinchina, Siam, Camboja, Malay Peninsula (lower reaches of Patani River), Java.

In captivity, according to Flower, this tortoise refuses all food except molluscs, crunching up and devouring eagerly the blue mussel.

Genus ORLITIA.

Gray, Ann. & Mag. N. H. (4) xi, p. 156 (1873).

Neural plates hexagonal, anterior lateral margins shortest. Plastron extensively united to the carapace by suture, with moderately long axillary and inguinal buttresses, the latter ankylosed between the fifth and sixth costal plates; entoplastron anterior to the humero-pectoral suture. Skull with a broad bony temporal arch; alveolar surfaces broad, of upper jaw with a strong median ridge; choanæ between the eyes. Skin of hinder part of head divided into small shields. Digits fully webbed. Tail very short.

A single species.

20. *Orlitia borneensis*.

Gray, *z. c.* p. 157; Siebenr. Zool. Anz. xxvii, p. 580 (1904).

Bellia borneensis, Bouleng. Cat. Chelon. p. 100 (1889).

Liemys inornata, Bouleng. Ann. & Mag. Nat. Hist. (6) xix, p. 26 (1897).

Carapace moderately depressed, rather narrow, smooth and rounded in the adult, very convex, tectiform, keeled posteriorly in the young; posterior border serrated in the young; nuchal shield triangular; vertebral shields narrower than costals, first, fourth, and fifth broader than long, second and third as long as broad or a little longer. Plastron smaller than the opening of the shell, truncate anteriorly, deeply notched behind, strongly angulate laterally in the young; the width of the bridge equals or exceeds the length of the posterior lobe; the longest suture is between the abdominal shields; axillary and inguinal shields present. Head large, short and broad; upper jaw hooked, more or less distinctly notched in the middle, with a very indistinct cusp on each side. Limbs with transversely enlarged, band-like scales. Uniform blackish brown above, lower surface of shell uniform yellow.

Length of shell 700 millim.

Borneo and Sumatra. A photograph of a large shell from the Dindings River, sent to me by Dr. R. Hanitsch, shows this tortoise

to exist also in the Malay Peninsula (*cf.* Hanitsch, Rep. Raffles Mus. 1904, p. 5). A stuffed specimen (shell 400 millim. in length) from Batang Padang, South Perak, presented by Mr. J. Cornwall in 1902, is preserved in the Selangor Museum, where there is also a carapace from Batu, Tiga, near Kuala Lumpur. A specimen from Penang is in the Calcutta Museum.

Genus CALLAGUR.

Gray, Suppl. Cat. Sh. Rept. i, p. 53 (1870).

Neural plates elongate, hexagonal, anterior lateral margins shortest. Plastron extensively united to the carapace by suture, with extremely developed axillary and inguinal buttresses, the former connected with the first rib, the latter anchylosed between the fifth and sixth costal plates; entoplastron anterior to the humero-pectoral suture. Skull with a bony temporal arch; alveolar surfaces broad, of upper jaw with a median ridge; edge of jaws denticulated; choanæ between the eyes. Upper surface of head covered with undivided skin. Digits very broadly webbed. Tail short.

A single species, of thoroughly aquatic habits; herbivorous.

21. *Callagur picta*.

Emys trivittata (non D. & B.), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 610 (1847).

Batagur picta, Gray, P. Z. S. 1862, p. 204.

Batagur affinis, Günth. Rept. Brit. Ind. p. 40, pl. iii, fig. C (1864).

Callagur picta, Gray, Suppl. Cat. Sh. Rept. i, p. 53 (1870); Bouleng. Cat. Chelon. p. 60 (1889).

Malay name, *Biuku*.

Carapace with a strong continuous vertebral and a feeble interrupted costal keel in the young, these keels disappearing in the adult; nuchal shield absent or extremely small and linear; second to fourth vertebral shields subequal in length, much broader than long in the young, nearly as long as broad, and nearly as broad as the costals, in the adult; postero-lateral border of the third vertebral shield concave. Plastron large, strongly angulated laterally in the young, convex in the adult, truncate anteriorly, notched posteriorly; the width of the bridge exceeds the length of the posterior lobe; the longest median suture is between the abdominal shields; inguinal shield large, axillary smaller. Head rather small; snout pointed, produced; upper jaw feebly notched in the middle. Limbs with transversely enlarged, band-like scales. Brown above, yellowish inferiorly; carapace with three broad, blackish longitudinal bands.

Length of shell 420 millim.

Penang, Selangor, Johore, Borneo, Philippines.

Genus **BATAGUR.**

Gray, Cat. Sh. Rept. i, p. 35 (1855).

Neural plates elongate, hexagonal, anterior lateral margins shortest. Plastron extensively united to the carapace by suture, with extremely developed axillary and inguinal buttresses, the former connected with the first rib, the latter ankylosed between the fifth and sixth costal plates; entoplastron anterior to the humero-pectoral suture. Skull with a very broad bony temporal arch; alveolar surfaces very broad, of upper jaw with two strong, slightly denticulated median ridges; edge of jaws denticulated; choanæ behind the level of the eyes. Limbs somewhat approaching the paddle-shape, very broadly webbed, with four claws. Tail very short.

A single species, of thoroughly aquatic habits; omnivorous.

22. **Batagur baska.**

Emys baska, Gray, Syn. Rept. p. 24 (1831).

Tetraonyx affinis, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 612 (1847).

Batagur baska, Gray, Cat. Sh. Rept. i, p. 35, pl. xvi (1855); Günth. Rept. Brit. Ind. p. 37, pl. iii, fig. B (1864); Bouleng. Cat. Chelon. p. 61 (1889); id. Faun. Brit. Ind., Rept. p. 38 (1890).

Malay name, *Tuntong*.

Carapace moderately depressed, with a vertebral keel in the young, which keel disappears in the adult; nuchal shield broader than long; second to fourth vertebral shields subequal, much broader than long in the young, nearly as long as broad and as broad as the costals in the adult; postero-lateral border of the third vertebral shield concave. Plastron large, strongly angulate laterally in the young, convex in the adult, truncate anteriorly, notched posteriorly; the width of the bridge exceeds the length of the posterior lobe; the longest median suture is between the abdominal shields; inguinal shield large, axillary smaller. Head rather small; snout pointed, produced; upper jaw feebly notched in the middle. Limbs with transversely enlarged, band-like scales. Olive brown above, yellowish beneath.

Length of shell 530 millim.

Bengal, Burma, Cochinchina, Malay Peninsula, Sumatra. Very common on all the larger rivers of the Peninsula, laying its eggs, the collecting of which is in many States a royal prerogative, on sandy banks, above the influence of the tides.

NOTE.—*Platysternum megacephalum*, Gray, P. Z. S. 1831, p. 106, representing the family Platysternidæ, allied to the Testudinidæ, remarkable for its very large head and its very long tail (longer than the carapace), and inhabiting Southern China, Siam, and Burma, should be alluded to here, a specimen having been obtained on Bukit Timah, about 10 miles from Singapore town. But it was probably introduced from Southern China.

Family CHELONIDÆ.

Shell covered with epidermal, horny shields. Neck short, incompletely retractile. Ear hidden. Temple completely roofed over; parietal bone in contact with the squamosal; parietals prolonged downwards towards the pterygoids. Limbs paddle-shaped, the digits of the fore limb much elongate; phalanges without condyles; claws one or two.

Marine turtles, approaching the shore only for the purpose of depositing their eggs, which are very numerous, spherical, soft-shelled, and buried in the sand.

Two genera :—

Costal shields 4 pairs	CHELONE, p. 27.
Costal shields 5 or more pairs	THALASSOCHELYS, p. 29.

Genus CHELONE.

Brongn. Bull. Soc. Philom. iii, p. 89 (1800).

Carapace with persisting fontanelles between the costal and marginal plates. Costal shields four pairs. An intergular shield and a series of inframarginal plastral shields. Head covered with symmetrical shields.

Two species :—

Upper jaw not hooked	<i>C. mydas</i> , p. 27.
Upper jaw hooked	<i>C. imbricata</i> , p. 28.

23. *Chelone mydas*.

Testudo mydas, Linn. Syst. Nat. i, p. 350 (1768).

Chelonia mydas, Schweigg. Prodr. p. 22 (1814); Bouleng. Cat.

Chelon. p. 180 (1889); id. Faun. Brit. Ind., Rept. p. 48 (1890).

Chelonia virgata, Schweigg. l. c.; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 617 (1847); Günth. Rept. Brit. Ind. p. 53 (1864).

Malay name, *Penyu*.

Carapace feebly unicarinate in the young, sometimes with slight indication of lateral keels, arched or subtectiform in the adult; dorsal shields juxtaposed; margin not or but indistinctly serrated, formed of 25 shields. Snout very short, jaws not hooked; horny sheaths of upper jaw with feebly denticulated edge and striated inner surface, of lower jaw with strongly denticulated ridges; symphysis of lower jaw short; one pair of præfrontal shields. Limbs usually with a single claw; the second digit sometimes provided with a distinct claw in young specimens. Young dark brown or olive above, the limbs margined with yellow; yellow beneath, with a large dark brown spot on the hand and foot.

Carapace of adult olive or brown, spotted or marbled with yellowish.

Length of shell 1100 millim.

Tropical and subtropical seas. Herbivorous; highly valued for its flesh (Green turtle). According to Cantor it is at all seasons plentifully taken in fishing-stakes in the Straits of Malacca. Very common throughout Malayan waters except in the vicinity of mangroves and mudbanks. Especially common on the Sembilan Islands on the west and the Redangs on the east coast of the Peninsula.

24. *Chelone imbricata*.

Testudo imbricata, Linn. Syst. Nat. i, p. 350 (1766).

Chelonia imbricata, Schweigg. Prodr. p. 21 (1814); Bouleng. Cat.

Chelon. p. 183 (1889); id. Faun. Brit. Ind., Rept. p. 49, fig. (1890); id. Fascic. Malay., Zool. i, p. 147 (1903).

Caretta squamata, Günth. Rept. Brit. Ind. p. 54 (1864).

Carapace tricarinate in the young, with the shields strongly imbricate, the vertebrals rhomboidal; dorsal shields of adult

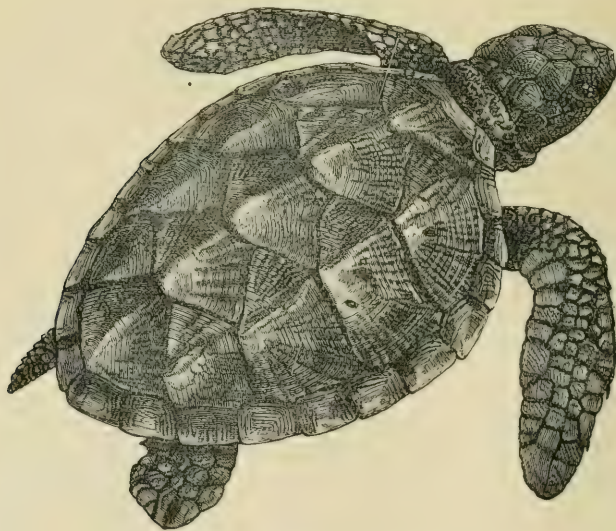


Fig. 7.—*Chelone imbricata* (young).

smooth, imbricate except in old specimens; margin formed of 25 shields. Snout compressed in the adult; jaws hooked, not or

but very feebly denticulated on the edge; symphysis of lower jaw long; two pairs of shields anterior to the azygous frontal. Limbs with two claws. Young pale brown above, blackish below; carapace of adult marbled yellow and dark brown, plastron yellow; shields of head and limbs dark brown with yellow borders.

Length of shell 850 millim.

Tropical and subtropical seas. Mainly carnivorous; valuable for its epidermal horny shields (tortoise-shell). Of rare occurrence on the coasts of the Malay Peninsula, large specimens being very seldom seen.

Genus **THALASSOCHELYS.**

Fitzing, Ann. Wien. Mus. i, p. 121 (1835).

Carapace completely ossified in the adult. Costal shields five pairs or more. A series of inframarginal plastral shields. Head covered with symmetrical shields.

A single species.

25. *Thalassochelys caretta*.

Testudo caretta, Linn. Syst. Nat. i, p. 351 (1766).

Chelonia olivacea, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 619 (1847).

Caouana olivacea, Günth. Rept. Brit. Ind. p. 52 (1864).

Thalassochelys caretta, Bouleng. Cat. Chelon. p. 184 (1889); id. Faun. Brit. Ind., Rept. p. 50 (1890); S. Flower, P. Z. S. 1896, p. 860; id. op. cit. 1899, p. 618.

Carapace of young with three strong keels, of adult arched or tectiform; dorsal shields juxtaposed; margin serrated posteriorly in the young, formed of 27 (rarely 25) shields. Intergular shield very small or absent. Head large, with very strong, hooked jaws; symphysis of lower jaw very long; alveolar surface of horny beak with a median ridge; two pairs of shields anterior to the azygous frontal. Limbs of young usually with two claws, of adult frequently with but one. Young uniform dark brown or blackish; adult brown above, yellowish beneath.

Length of shell 1050 millim.

Tropical and warm seas. Carnivorous, feeding chiefly on crustaceans and molluscs. Of no commercial value. Rare according to Cantor at Penang, whence there is a specimen in the Perak Museum, Taiping.

Family SPHARGIDÆ.

Shell formed of numerous small bones disposed like mosaic, separated from the underlying vertebræ and ribs. Ear hidden. Neck short, incompletely retractile. Plastron much reduced; no entoplastron. Temple completely roofed over; parietal bone in contact with the squamosals, without downward prolongation. Limbs paddle-shaped, the digits of the fore limb much elongate; phalanges without condyles; no claws.

Habits similar to those of the Chelonidæ.

A single genus.

Genus **DERMOCHELYS**.

Blainv. Journ. de Phys. lxxxiii, p. 259 (1816).

Dorsal shield completely, ventral shield incompletely bony in the adult, the former with seven, the latter with five keels. Beak with two triangular cusps, between three deep notches; jaws sharp-edged. Head with symmetrical horny shields in the young, these shields disappearing with age.

A single species.

26. **Dermochelys coriacea**.

Testudo coriacea, Linn. Syst. Nat. i, p. 350 (1766).

Sphargis coriacea, Gray, Syn. Rept. i, p. 51 (1831).

Dermatochelys coriacea, Günth. Rept. Brit. Ind. p. 55 (1864).

Dermochelys coriacea, Bouleng. Cat. Chelon. p. 10 (1889); id. Faun. Brit. Ind., Rept. p. 50 (1890); Kloss, Journ. Straits Branch Roy. Asiat. Soc. No. 49, p. 63, pls. i-iii (1907).

Malay name, *Kambau*.

Fore limb as long as dorsal shield in the young, shorter in the adult. Colour dark brown, uniform or spotted with yellowish white; the dorsal keels and the border of the limbs yellowish in the young.

Grows to a length of $2\frac{1}{2}$ metres (8 feet).

A pelagic turtle, known as the Leathery turtle, generally distributed between the tropics, but scarce everywhere; an accidental visitor in temperate seas. Has been known to deposit its eggs, similar to those of the true Turtles, on the coast of Tenasserim, and is also known to lay on a sandy patch at the south entrance of Klang Straits, Selangor. A very large male specimen (Kloss, *loc. cit.*) was obtained in Johore Straits in 1905, weighing nearly a thousand pounds and measuring in a straight line from tip of head to tip of tail 2·34 metres, with an extreme breadth of carapace of 84 cm. A smaller specimen from Singapore Straits is in the Raffles Museum of that city.

Feeds chiefly on crustaceans and molluscs.

Order **SQUAMATA.**

Quadrate bone free distally; no lower temporal arch. Ribs single-headed. Teeth not implanted in sockets. Vent transverse; copulatory organ present, paired.

The Malay representatives of this Order, which includes the great bulk of living Reptiles, belong to two suborders:—

I. **LACERTILIA**, Lizards.—Mandibular rami united by suture. Limbs usually present.

II. **OPHIDIA**, Snakes.—Mandibular rami connected by ligament. Limbs absent.

Suborder *LACERTILIA*.

Externally, Lizards may be distinguished from Snakes, either by the presence of limbs, or, in the limbless forms (of which only one representative, *Dibamus*, pertains to this fauna), by the tongue not being retractile into a basal sheath. As a rule either moveable eyelids or a distinct ear-opening serve to further distinguish Lizards from Snakes.

Of the twenty families into which this Suborder is divided, only six have representatives in the Malay Peninsula.

Synopsis of the Families.

I. Upper surface of head covered with small scales or granules.

No moveable eyelids or pupil vertical; dorsal scales granular or tubercular; tongue short, very feebly nicked in front **Geckonidæ**, p. 32.

Moveable eyelids; pupil round; dorsal scales often imbricate; tongue short, very feebly nicked in front **Agamidæ**, p. 54.

Moveable eyelids; pupil round; dorsal scales granular; tongue long, exsertile, bifid **Varanidæ**, p. 74.

II. Upper surface of head covered with large symmetrical shields.

Large ventral shields, sharply differentiated from the scales on the sides; inguinal or femoral pores **Lacertidæ**, p. 79.

Scales on body uniform, roundish, imbricate; eyes well developed; no inguinal or femoral pores .. **Scincidæ**, p. 80.

Scales on body uniform, roundish, imbricate; eyes rudimentary, hidden under shields **Dibamidæ**, p. 98.

Family GECKONIDÆ.

Skull without postorbital or postfronto-squamosal arch; no squamosal; præmaxillary single; nasals distinct; parietals distinct; frontals completely surrounding the olfactory lobes of the brain; a fibro-cartilaginous interorbital septum; a columella

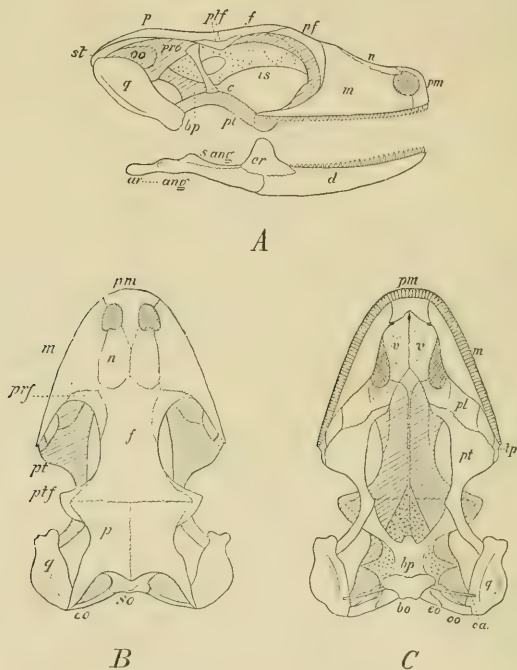


Fig. 8.—Skull of *Gecko verticillatus*.

A. Side view.	B. Upper view.	C. Lower view.
<i>ang.</i> Angular.	<i>f.</i> Frontal.	<i>pro.</i> Prootic.
<i>ar.</i> Articular.	<i>is.</i> Interorbital septum.	<i>pt.</i> Pterygoid.
<i>bo.</i> Basioccipital.	<i>m.</i> Maxillary.	<i>ptf.</i> Postfrontal.
<i>bp.</i> Basisphenoid.	<i>n.</i> Nasal.	<i>q.</i> Quadrate.
<i>c.</i> Columella cranii.	<i>oo.</i> Opisthotic.	<i>s.ang.</i> Supra-angular.
<i>c.a.</i> Columella auris.	<i>p.</i> Parietal.	<i>so.</i> Supraoccipital.
<i>cr.</i> Coronoid.	<i>pl.</i> Palatine.	<i>st.</i> Supratemporal.
<i>d.</i> Dentary.	<i>pm.</i> Præmaxillary.	<i>tp.</i> Transpalatine.
<i>eo.</i> Exoccipital.	<i>prf, pf.</i> Præfrontal.	<i>v.</i> Vomer.

cranii; mandible containing only five bones, the angular and articular having coalesced. Teeth small, numerous, with cylindrical shaft ankylosed to the inner edge of the jaws (Pleurodont

dentition); no teeth on the palate. Vertebrae amphicelous (bi-concave). Clavicle dilated and perforated proximally; interclavicle rhomboidal or cruciform.

Tongue short, very feebly nicked in front, smooth or villose. Eye usually large, frequently with vertical pupil, usually without connivent eyelids. Scales usually granular or tubercular above; no symmetrical shields on the top of the head. Limbs well developed; digits often dilated, adapted for climbing up smooth

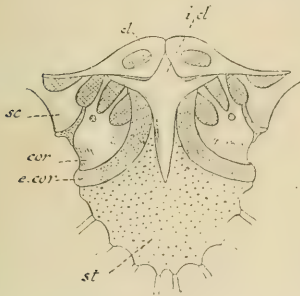


Fig. 9.—Pectoral arch of *Gecko verticillatus*. Fig. 10.—Tongue of same.

cl. Clavicle.
cor. Coracoid.

i.cl. Interclavicle.
st. Sternum.

e.cor. Epicoracoid.
sc. Scapula.

surfaces. Femoral or præanal pores frequently present in the males. Tail usually very fragile.

More or less nocturnal lizards occurring over all the hotter parts of the world. So far as is known, the Malay Geckos lay round, hard-shelled eggs.

We have here to deal with representatives of nine genera.

Synopsis of the Genera.

I. Digits not dilated, all clawed.

- | | |
|--|-------------------------|
| Pupil vertical; claw between two scales. . | GYMNODACTYLUS, p. 35. |
| Pupil round; claw between two scales . . | GONATODES, p. 38. |
| Pupil vertical; claw between three scales. | ÆLUROSCALABOTES, p. 39. |

II. Digits strongly dilated.

A. Digits with a compressed distal joint, rising from within the extremity of the expansion; sub-digital lamellæ paired.

- | | |
|--|----------------------|
| Inner digit clawed; lateral expansion of body, if present, scaled like the body . . | HEMIDACTYLUS, p. 40. |
| Inner digit clawed; a much developed lateral expansion covered with large tetragonal scales arranged like bricks . . | MIMETOZOOX, p. 45. |
| Inner digit clawless | GEHYRA, p. 46. |

- B. Digits with the compressed joint short and rising from the extremity of the expansion; inner digit clawless.

Digits free or with a rudiment of web; subdigital lamellæ paired

LEPIDODACTYLUS, p. 48.

Digits free or webbed at the base; a single series of subdigital lamellæ

GECKO, p. 50.

Digits extensively webbed; a single series of subdigital lamellæ; a much developed dermal expansion on the side of the body

PTYCHOZOOM, p. 52.

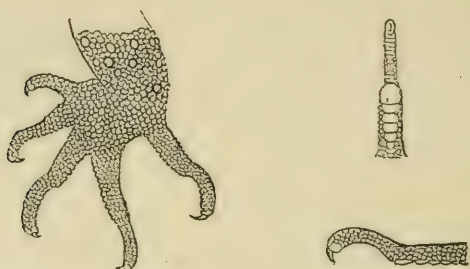


Fig. 11.—*Gynnodactylus khasiensis*. Foot and lower and side views of toe.



Fig. 12.—*Hemidactylus flaviviridis*. Upper and lower surface of foot.



Fig. 13.—*Gehyra mutilata*. Lower surface of foot and side view of toe.

Genus **GYMNODACTYLUS.**

Spix, Spec. nov. Lacert. p. 17 (1825).

Digits not dilated, clawed, cylindrical or slightly depressed at the base; the two or three distal phalanges compressed, forming an angle with the basal portion of the digit; the claw between two enlarged scales, the lower of which is more or less deeply notched under the claw; digits beneath with a row of more or less distinct transverse plates. Body with granular scales and tubercles. Pupil vertical. Males with or without præanal or femoral pores.

Borders of the Mediterranean, Southern Asia, Australia, Islands of the Pacific, Tropical America.

Four species in the Malay Peninsula.

Synopsis of the Species.

I. Lower surface of tail covered with small scales.

Ear-opening suboval, about one third diameter of eye; male with præanal and femoral pores

G. marmoratus, p. 35.

Ear-opening subtriangular, about half diameter of eye; male with præanal pores only

G. peguensis, p. 36.

II. Lower surface of tail with a row of large transverse plates.

About 30 ventral scales in a transverse series; males with a pubic groove containing pores; femoral pores present

G. pulchellus, p. 36.

About 55 ventral scales in a transverse series; males without pubic groove, with præanal pores only

G. consobrinus, p. 37.

27. *Gymnodactylus marmoratus*.

Phyllurus marmoratus (Kuhl), Fitzing. N. Class. Rept. p. 47 (1826).

Gymnodactylus marmoratus, Dum. & Bibr. Erp. Gén. iii, p. 426, pl. xxxiv, fig. 1 (1836); Bouleng. Cat. Liz. i, p. 44 (1885);

S. Flower, P. Z. S. 1899, p. 62; Laidlaw, P. Z. S. 1901, i, p. 304;

Bouleng. Fascic. Malay., Zool. i, p. 148 (1903).

Ear-opening suboval, oblique, about one third diameter of eye. Limbs rather elongate; digits strong, slightly depressed at the base, with well-developed transverse plates inferiorly. Head granular, with very small tubercles on the occipital and temporal regions; rostral with median cleft above, entering the nostril; 10 to 12 upper and 9 or 10 lower labials; symphyseal triangular; two or three pairs of chin-shields, median largest and forming a suture behind the symphyseal. Body and limbs covered above with small granules intermixed with small roundish, feebly keeled, subtriangular tubercles; a more or less defined series of tubercles from axilla to groin, limiting the abdominal region; ventral scales

small, imbricate, 40 to 50 in a transverse series. Males with præanal and femoral pores; the former 12 or 13 altogether, in a Λ -shaped series, enclosing a groove, the latter widely separated from the former, 4 to 6 on each side. Tail covered with uniform small flat scales, above with a few scattered tubercles. Light brown above, with dark brown spots, which may be confluent into cross-bars; a dark brown streak on each side of the head, passing through the eye; tail with dark annuli; lower parts brownish.

From snout to vent 76 millim.; tail 72.

Malay Peninsula and Archipelago.—Known from Penang, Perak, Legeh, and Jalar on Bukit Besar (2500 feet), where it is not uncommon on tree-trunks in the jungle, and when disturbed frequently runs down to the ground; it is also found under stones.

28. *Gymnodactylus peguensis*.

Bouleng. Ann. Mus. Civ. Genova (2) xiii, p. 314, pl. vii, fig. 2 (1893); Laidlaw, P. Z. S. 1901, i, p. 304.

Ear-opening subtriangular, half diameter of eye. Limbs moderate; toes short, scarcely depressed at the base, the plates under the basal phalanx small, much narrower than the digit, roundish, convex. Head granular, with minute tubercles on the occiput; rostral with median cleft above, entering the nostril; 9 upper and 7 or 8 lower labials; symphysial triangular; four pairs of chin-shields, the median largest and forming a suture behind the symphysial. Body and limbs granulate above, with numerous small, round, keeled tubercles; a feeble fold along the side; ventral scales small, imbricate, about 45 in a transverse series. Males with an angular series of 7 or 8 præanal pores; no femoral pores. Tail covered with small scales. Pale grey above, with blackish-brown markings edged with whitish, viz. several spots on the top of the head, a U-shaped band from eye to eye across the nape, two series of large spots on the back, and a series of smaller spots along each side; lower parts whitish.

From snout to vent 64 millim.; tail 64.

Originally described from Palon, Pegu; has since been re-discovered in Patelung and Legeh by Dr. Annandale.

29. *Gymnodactylus pulchellus*.

Cyrtodactylus pulchellus, Gray, Zool. Journ. iii, p. 224 (1828); id. Ill. Ind. Zool. ii, pl. lxxiv (1834).

Gymnodactylus pulchellus, Günth. Rept. Brit. Ind. p. 113 (1864); Bouleng. Cat. Liz. i, p. 46 (1885); id. Faun. Brit. Ind., Rept. p. 46 (1890); S. Flower, P. Z. S. 1899, p. 626; Bouleng. Fascic. Malay., Zool. i, p. 148 (1903).

Ear-opening suboval, vertical or slightly oblique, one third or two-fifths diameter of eye. Limbs rather elongate; digits strong,

slightly depressed at the base, with well-developed transverse plates inferiorly. Head granular, with small round tubercles on the occipital and temporal regions; rostral with median cleft above, entering the nostril; 10 to 13 upper and 10 to 12 lower labials; symphyseal triangular; two or three pairs of chin-shields, median largest and forming a suture behind the symphyseal. Body and limbs covered above with small flat granules intermixed with small roundish, keeled, subtriangular tubercles; a series of keeled tubercles from axilla to groin, bordering the abdominal region; ventral scales moderately large, imbricate, about 30 in a transverse series. Male with a longitudinal groove on the pubic region, containing two parallel series of preanal pores, forming a right angle with a long series of femoral pores; altogether 18 to 20 pores on each side, 4 or 5 of which are in the groove. Tail above with small flat scales and annuli of feebly keeled tubercles, beneath with a series of large transverse plates. Light yellowish brown in life, with five dark rich brown cross-bands bordered with white or yellow; the first band horseshoe-shaped, from eye to eye over the nape; tail with complete dark annuli; lower parts dirty white or bluish buff; iris golden-brown.

From snout to vent 115 millim.; tail 144.

Bengal, Tenasserim, Malay Peninsula (Penang Hills, 2000-2400 ft., Larut Hills, Perak, 3400-4400 ft.; Batu Caves, Kuala Lumpur, Selangor; Jalor Caves, Bukit Besar, 2500 ft., and Goah Tanah, near Biserat). Also recorded from Singapore.

According to Flower, this Gecko is nocturnal, usually living on rocks. Bites fiercely when handled. Very common in many of the limestone caves so abundant throughout the Peninsula.

30. *Gymnodactylus consobrinus*.

Peters, Mon. Berl. Ac. 1871, p. 519; id. Ann. Mus. Civ. Genova, iii, pl. ii, fig. 1 (1872); Bouleng. Cat. Liz. i, p. 47 (1885).

Similar to the preceding, but ear-opening smaller, granules and tubercles on the upper parts smaller, the dorsal tubercles not or but very indistinctly keeled, ventral scales much smaller (about 55 in a transverse series), and no pubic groove or femoral pores. 9 to 11 preanal pores, in an angular series. Grey-brown above, with darker transverse bands, 4 to 8 in number, much wider than the interspaces between them; tail with large dark and small light annuli; in the young, the dark bands almost black and the interspaces white; lower parts dirty white.

From snout to vent 115 millim.; tail 130.

Originally described from Borneo. Has since been found at Gunong Angsi, Negri Sembilan, at an altitude of 2500 ft., but has not been met with elsewhere in the Malay Peninsula.

Genus **GONATODES.**

Fitzing. Syst. Rept. p. 91 (1843).

Digits slender, clawed, cylindrical or depressed at the base; the distal phalanges compressed, forming an angle with the basal portion of the digits, the lower surface of which bears a row of plates. Body more or less depressed, granular or tubercular above. Pupil circular; eyelid distinct all round the eye. Males with or without præanal or femoral pores.

Southern Asia, Tropical Africa, Tropical America.

Two species in the Malay Peninsula:—

Base of raised portion of digits with transverse plates beneath	<i>G. kendalli</i> , p. 38.
Base of raised portion of digit with small irregular scales beneath	<i>G. affinis</i> , p. 38.

31. Gonatodes kendalli.

Heteronota kendallii, Gray, Cat. Liz. p. 174 (1845).

Gonatodes kendallii, Bouleng. Cat. Liz. i, p. 63, pl. v, fig. 4 (1885);

S. Flower, P. Z. S. 1896, p. 863, and 1899, p. 627; Ridley, Journ.

Straits Branch Roy. Asiatic Soc. No. 32, p. 193 (1899).

Habit slender. Snout long and broad, rounded, depressed; ear-opening vertically oval, not more than half diameter of orbit. Limbs elongate; digits inferiorly with transverse lamellæ and a large oval plate at the articulation between the basal and the raised portion. Upper parts covered with minute granules intermixed on the body with irregularly arranged small keeled tubercles; rostral with median cleft above, entering the nostril; 11 to 13 upper and 10 to 12 lower labials; symphyseal very large, subtriangular; a pair of large chin-shields. Ventral scales very small, juxtaposed, convex, keeled. No præanal or femoral pores. Tail slender, with small keeled scales and large pointed tubercles, of which there is sometimes a median series along the lower surface. Colour in life, yellow above, marked with reddish brown and dark brown; tail alternately banded yellow and reddish brown; lower parts purplish grey; iris orange.

From snout to vent 80 millim.; tail 60.

First described from Borneo, this species has since been found at Bukit Timah, Singapore; Larut Hills, Perak, 3400–4600 ft.; and on Great Natuna Island.

During the daytime, according to Flower's observations at Singapore, it hides in crevices under big rocks in the jungle.

32. Gonatodes affinis.

Cyrtodactylus affinis, Stoliczka, Journ. Asiat. Soc. Bengal, xxxix, p. 167, pl. x, fig. 1 (1870).

Gymnodactylus affinis, Bouleng. Cat. Liz. i, p. 42 (1885).

Gonatodes penangensis, S. Flower, P. Z. S. 1896, p. 863, pl. xliv fig. 1.

Gonatodes affinis, S. Flower, P. Z. S. 1898, p. 455; id. P. Z. S. 1899, p. 627; Laidlaw, P. Z. S. 1901, i, p. 304; Bouleng. Fascic. Malay., Zool. i, p. 148 (1903).

Very similar to the preceding. Distinguished by the scaling of the lower side of the digits, the basal phalanx of the raised portion being covered with small irregular scales instead of lamellæ, and by the presence, in males, of femoral pores, 5 to 8, arranged in an obtusely angular or crescent-shaped line. Colour in life, yellowish brown above, mottled with dark brown, deepest (rich red dark brown) on the shoulders; five transverse yellow bands, two anterior very bright, three posterior more or less indistinct in some specimens; the tubercles on the anterior yellow bands of a brilliant golden colour; lower surface of head bright orange, belly purplish grey; tail with alternate bands of light and dark brown.

From snout to vent 47 millim.; tail 45.

Inhabits the caves among the granite rocks on Penang Hill, 2200–2400 ft. Has also been found in the Batu Caves, Selangor, by Capt. Flower; on Gunong Inas, North Perak, 3000–4000 ft., by Mr. Laidlaw; on Bukit Besar, Jalor, 2500 ft., by Dr. Annandale.

A very active lizard, to be found running over the walls both by day and night; also found on tree-trunks in the jungle.

Genus **ÆLUROSCALABOTES.**

Ælurosaurus (non Owen), Bouleng. Cat. Liz. i, p. 73 (1885).

Æluroscalabotes, Bouleng. op. cit. iii, p. 482 (1887).

Digits short, cylindrical at the base, and with transverse lamellæ inferiorly, compressed in the distal phalanges, which are raised and furnished with a claw retractile between three plates forming a compressed sheath. Body with small juxtaposed flat scales. Upper and lower eyelids well developed. Pupil vertical. Males with præanal pores.

Malay Peninsula and Borneo.

33. *Æluroscalabotes felinus*.

Pentadactylus felinus, Günth. Rept. Brit. Ind. p. 117, pl. xii, fig. F (1864).

Ælurosaurus felinus, Bouleng. Cat. Liz. i, p. 73, pl. iii, fig. 8 (1885).

Æluroscalabotes felinus, Bouleng. op. cit. iii, p. 482 (1887).

Habit slender. Snout pointed; ear-opening small. Body long, not depressed, limbs long and thin. Rostral broad and low, separated from the nostril; 13 upper and as many lower labials,

the latter in contact with another series of equally large shields; symphyseal small. Tail short, rounded, vertically oval, ending in a very obtuse point, probably prehensile. Male with 21 præanal pores in an angular series. Brown above, with two dorsal series of more or less distinct lighter, dark-edged roundish spots; sometimes scattered white dots on the sides of the body; upper lip whitish; lower surfaces whitish, brown-dotted.

From snout to vent 94 millim.; tail 63.

The type specimen of this remarkable Gecko is stated to be from Singapore, where Mr. Ridley has also collected it. The species has recently been obtained in some numbers from the Larut Hills in Perak and is also known from Borneo.

Genus **HEMIDACTYLUS**.

Gray, Ann. Phil. (2) x, p. 199 (1825).

Digits free or more or less webbed, the base dilated and bearing two rows of lamellæ beneath; the two distal phalanges compressed and slender, rising from within the extremity of the dilated portion; all the digits clawed. Dorsal lepidosis uniform or heterogeneous. Pupil vertical. Males with præanal or femoral pores.

Southern Europe, Southern Asia, Africa, Tropical America, Polynesia.

Geckos of this genus are the commonest of the house lizards in the Peninsula and are known as *Chi-chah*.

* *Synopsis of the Species.*

I. Digits free or with a rudiment of web.

- A. Slender compressed joint of inner digit very short; 4 or 5 lamellæ* under the hallux, 9 or 10 under the fourth toe; dorsal granules uniform or with scattered, small, round convex tubercles . . . *H. frenatus*, p. 41.

- B. Slender compressed joint of inner digit at least half as long as dilated portion.

1. Strongly keeled or trihedral dorsal tubercles.

- 4 to 6 lamellæ under the hallux, 6 to 8 under the fourth toe; tail rounded at the sides; males with 8 to 20 femoro-præanal pores on each side *H. brooki*, p. 42.

- 6 or 7 lamellæ under the hallux, 10 or 11 under the fourth toe; tail with sharp denticulated lateral edge; males with 17 or 18 femoral pores on each side *H. depressus*, p. 43.

* Counted longitudinally, each pair reckoned as one.

2. Enlarged dorsal tubercles, if present, small, smooth, conical or very feebly keeled.
- 6 or 7 lamellæ under the hallux, 9 to 11 under the fourth toe; males with 12 to 16 femoral pores on each side; tail not denticulated on the sides *H. leschenaultii*, p. 43.
- 8 to 10 lamellæ under the hallux, 11 to 13 under the fourth toe; males with 5 or 6 femoral pores on each side; tail not denticulated on the sides *H. flaviviridis*, p. 44.
- 6 or 7 lamellæ under the hallux, 11 to 14 under the fourth toe; male with 14 to 19 femoral pores on each side; tail with sharpish, denticulated lateral edge..... *H. garnoti*, p. 44.
- II. Digits nearly half-webbed; a cutaneous expansion from axilla to groin; males with 17 or 18 femoral pores on each side *H. platyurus*, p. 45.

34. *Hemidactylus frenatus*.

Dum. & Bibr. Erp. Gén. iii, p. 366 (1836); Günth. Rept. Brit. Ind. p. 161 (1864); Bouleng. Cat. Liz. i, p. 120 (1885); id. Faun. Brit. Ind., Rept. p. 85 (1890); S. Flower, P. Z. S. 1899, p. 628.

Digits moderately dilated, free, inner with sessile claw; 4 or 5 lamellæ under the inner digits, 7 to 9 under the fourth finger, 9 or 10 under the fourth toe. Rostral with median cleft above, entering the nostril; 10 to 12 upper and 8 to 10 lower labials; symphysial large, triangular or pentagonal; two or three pairs of chin-shields, the median in contact behind the symphysial. Upper surface of body granular, usually with more or less numerous irregularly scattered, small, round, convex tubercles. Male with a series of 30 to 36 femoral pores, not interrupted on the præanal region. Tail rounded, feebly depressed, covered above with very small smooth scales and six longitudinal series of keeled tubercles, below with a median series of transversely dilated plates. Greyish or pinkish brown above, uniform or more or less distinctly marbled with darker; head generally variegated with brown; a more or less defined brown streak, light-edged above, on the side of the head, passing through the eye, sometimes extending along the side of the body; whitish beneath.

From snout to vent 65 millim.; tail 68.

From China and India to the Malay Peninsula and Archipelago; islands of the Western Pacific and Indian Oceans; East Africa; St. Helena.

The commonest house gecko throughout the Malay Peninsula. Often found on boats and steamers, which explains its wide distribution. It frequents, houses, gardens, and the open country, where it conceals itself in the daytime, but indoors it is not strictly nocturnal.

35. *Hemidactylus brookii*.

Gray, Cat. Liz. p. 153 (1845); Bouleng. Cat. Liz. i, p. 128 (1885);
id. Ann. & Mag. Nat. Hist. (7) i, p. 123 (1898).

Hemidactylus maculatus, Kelaart, Prodr. p. 158 (1855); Günth.
Rept. Brit. Ind. p. 107 (1864).

Hemidactylus gleadorii, Murray, Zool. Sind, p. 360 (1884); Bouleng.
Cat. Liz. p. 129 (1885); id. Faun. Brit. Ind., Rept. p. 86, fig. 27
(1890).

Digits moderately dilated, free; 4 to 6 lamellæ under the inner digits, 6 to 8 under the median. Rostral with median cleft above, entering the nostril; 8 to 10 upper and 7 to 9 lower labials; symphysial large, triangular or pentagonal; chin-shields generally four, median pair largest and in contact behind the symphysial. Upper surface of body granular, with strongly keeled, trihedral tubercles, forming 16 to 20 pretty regular longitudinal series. Male with a series of 16 to 40 femoral pores,



Fig. 14.—*Hemidactylus brookii*.

usually interrupted in the middle. Tail rounded, depressed, above with small scales and 6 or 8 longitudinal series of large, pointed, strongly keeled tubercles, below with a median series of transversely dilated plates. Brownish above, spotted with darker; a dark streak on the side of the head, passing through the eye; lower parts dirty white.

From snout to vent 58 millim.; tail 60.

Southern China and India to Malay Peninsula and Archipelago ; Tropical Africa.

Recorded from Singapore.

36. *Hemidactylus depressus*.

Gray, Zool. Misc. p. 58 (1842); Bouleng. Cat. Liz. i, p. 134 (1885); id. Faun. Brit. Ind., Rept. p. 90 (1890).

Hemidactylus pieresii, Kelaart, Prodr. p. 159 (1855).

Digits distinctly webbed at the base, moderately dilated; 6 or 7 lamellæ under the inner digits, 9 to 11 under the median. Rostral with median cleft above, entering the nostril; 10 to 12 upper and 8 to 10 lower labials; symphyseal large, triangular or pentagonal; four large chin-shields, median pair the larger, forming a long suture behind the symphyseal. A fold of the skin on each side of the belly, from axilla to groin. Upper surface of body with small flat granules intermixed with trihedral tubercles forming 16 to 20 very irregular longitudinal series. Male with a series of 34 to 36 femoral pores interrupted in the middle. Tail much depressed, flat below, with angular lateral edge, covered above with small pointed imbricate scales, which are enlarged and raised on the sides, forming a strong denticulation, and with 6 or 8 series of spine-like tubercles forming rings; below with a series of transversely enlarged plates. Light brown above, marbled or cross-banded with brown; a dark brown streak, white-edged above, on the side of the head, passing through the eye; lower parts whitish.

From snout to vent 80 millim.; tail 76.

This species inhabits Ceylon. A specimen stated to be from Singapore is preserved in the British Museum.

37. *Hemidactylus leschenaultii*.

Dum. & Bibr. Erp. Gén. iii, p. 364 (1836); Günth. Rept. Brit. Ind. p. 109 (1864); Bouleng. Cat. Liz. i, p. 136 (1885); id. Faun. Brit. Ind., Rept. p. 91 (1890).

Digits free, strongly dilated; 5 to 7 lamellæ under the inner digits, 9 to 11 under the median. Rostral with median cleft above, entering the nostril; 10 to 12 upper and 8 or 9 lower labials; symphyseal large, triangular or pentagonal; four chin-shields, median pair the larger and in contact behind the symphyseal. A slight fold of the skin on each side of the belly, from axilla to groin. Upper surface of body with small granules, uniform or intermixed with more or less numerous scattered round tubercles. Males with a series of 24 to 32 femoral pores, interrupted in the middle. Tail depressed, flat below, covered above with small smooth scales and 6 longitudinal series of conical tubercles; beneath with a series of transversely enlarged plates. Grey above, with darker markings forming wavy cross-bands,

rhomboidal spots on the middle of the back, or regular longitudinal bands; a dark band from the eye to the shoulder; lower parts white.

From snout to vent 80 millim.; tail 82.

Inhabits India and Ceylon. A specimen from Penang, from Dr. Cantor's collection, is in the British Museum.

38. *Hemidactylus flaviviridis*.

Rüppell, N. Wirbelth., Rept. p. 18, pl. vi, fig. 2 (1835).

Hemidactylus coctæi, Dum. & Bibr. Erp. Gén. iii, p. 365 (1836);

Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 630 (1847); Günth.

Rept. Brit. Ind. p. 100 (1864); Bouleng. Cat. Liz. i, p. 137 (1885);

id. Faun. Brit. Ind., Rept. p. 92 (1890).

Digits free, strongly dilated; 8 to 10 lamellæ under the inner digits, 11 to 13 under the median. Rostral with median cleft above, entering the nostril; 12 to 15 upper and 10 or 11 lower labials; symphysial large, triangular or pentagonal; two or three pairs of chin-shields, median largest and in contact behind the symphysial. Upper surface of body with small granules, sometimes with scattered enlarged ones on the sides. Male with a short series of 5 or 6 pores under each thigh. Tail depressed, flat beneath, covered above with small smooth scales and 4 or 6 longitudinal series of conical tubercles; beneath with a series of transversely enlarged plates. Grey or greenish above, uniform or with indistinct darker markings; lower parts white.

From snout to vent 76 millim.; tail 81.

From the Red Sea to India, where it is a common house gecko. A specimen from Penang, from Dr. Cantor's collection, is in the British Museum, but, like the preceding species, it has not been rediscovered in any part of the Malay Peninsula.

39. *Hemidactylus garnoti*.

Dum. & Bibr. Erp. Gén. iii, p. 368 (1836); Bouleng. Cat. Liz. i,

p. 141 (1885); id. Faun. Brit. Ind., Rept. p. 94 (1890); Laidlaw,

P. Z. S. 1901, i, p. 305.

Digits free or with a slight rudiment of web, moderately dilated; 6 or 7 lamellæ under the inner digits, 11 to 14 under the median. Rostral with median cleft above, entering the nostril; 12 or 13 upper and 9 to 11 lower labials; symphysial large, triangular, in contact posteriorly with a pair of pentagonal chin-shields, followed by a second smaller pair; the anterior pair of chin-shields in contact, the posterior separated from each other. Upper surface of body covered with minute granular scales. Male with 14 to 19 femoral pores on each side. Tail depressed, flat beneath, with sharp denticulated lateral edge; scales on upper surface very small, equal, those on lower surface larger, with a median series of transverse plates. Brownish grey above, uniform or with more or

less distinct brown and whitish spots; lower parts uniform whitish.

From snout to vent 60 millim.; tail 69.

Sikkim, Burma, Malay Peninsula and Archipelago, South Pacific Islands. Rare in the Malay Peninsula, where two specimens were caught inside a house by Mr. Laidlaw, at Kuala Aring, Kelantan.

40. *Hemidactylus platyurus*.

Stellio platyurus, Schneid. Amph. Phys. ii, p. 30 (1790).

Nycteridium schneideri, Günth. Rept. Brit. Ind. p. 111 (1864).

Hemidactylus platyurus, Bouleng. Cat. Liz. i, p. 143 (1885); id.

Faun. Brit. Ind., Rept. p. 95 (1890); S. Flower, P. Z. S. 1899, p. 629.

Body and limbs much depressed; a cutaneous expansion from axilla to groin, and another bordering the hind limb posteriorly. Digits about half-webbed, strongly dilated; 5 or 6 lamellæ under the inner digits, 7 to 9 under the median. Rostral with median cleft above, entering the nostril; 9 to 11 upper and 7 or 8 lower labials; symphysial large, triangular or pentagonal, in contact with two large chin-shields, followed by two smaller ones. Upper parts covered with uniform small granules. Male with an uninterrupted series of femoral pores, 17 or 18 on each side. Tail much depressed, flat beneath, with sharp denticulated lateral edge, above with uniform small granules, below with a series of transverse plates. Grey above, more or less speckled or marbled with brown; often with quadrangular dark spots in pairs along the back, each pair situated on a reddish-brown transverse band; tail with similar dark cross-bands; a dark line on each side of the head, passing through the eye, usually present; beneath bright lemon-yellow, pale yellow, or dirty white, tail sometimes coral-red.

From snout to vent 61 millim.; tail 66.

Ceylon, Darjeeling, Burma, Siam, S. China, Malay Peninsula and Archipelago.

Common in houses and gardens at Singapore. Also known from Penang; Khota Bharu, Kelantan; Trengganu, Patani; and Bukit Besar. Decidedly more of a jungle species than *H. frenatus*.

Genus **MIMETOZoon**.

Bouleng. P. Z. S. 1896, p. 767.

Digits extensively webbed, strongly dilated, with two rows of lamellæ beneath; the two distal phalanges compressed and slender, rising from within the extremity of the dilated portion; all the digits clawed. Limbs and sides of head, body, and tail with much-developed dermal expansions. Upper surfaces covered with juxtaposed granular scales and tubercles, the parachute-membrane

covered above with imbricate tetragonal scales arranged like bricks. Pupil vertical.

A single species is known, which stands in the same relation to *Hemidactylus* as *Ptychozoon* to *Gecko*.

41. *Mimetozone craspedotus*.

Hemidactylus craspedotus, Mocquard, Le Naturaliste, 1890, p. 144.

Mimetozone floweri, Bouleng. l. c. pl. xxxvi.

Head slightly distinct from neck; snout obtusely pointed, much longer than the distance between eye and ear-opening, once and a-half diameter of orbit; forehead concave; ear-opening oval, horizontal. Body and limbs much depressed; digits short, two-thirds webbed; 5 lamellæ under inner digit, 8 or 9 under fourth. Tail much depressed, bordered on each side by a broad dermal fold with serrated edges. Rostral quadrangular, broader than deep; nostril pierced between the rostral and 4 scales; 12 upper and 10 lower labials; symphyseal triangular; two pairs of chin-shields, the median forming a suture behind the symphyseal. Head, back, and limbs covered with small granules, largest on the snout; occiput and back with numerous small, round, smooth tubercles; ventral scales small, cycloid, imbricate, smooth. Tail covered with small granular scales, the muscular portion with transverse rows of small smooth tubercles above and a series of transverse shields beneath. Grey above, speckled with brown, with quadrangular dark spots disposed in pairs along the back, connected by brownish bars and wavy transverse lines, and confluent into cross-bars on the tail; a dark streak on each side of the head, passing through the eye; pale yellow beneath, speckled with blackish on the sides, the muscular portion of the tail coral-red.

From snout to vent 49 millim.; tail 56.

North Borneo (Kina Balu) and Penang. A single specimen was caught by Capt. Flower on the ground in the garden of the "Crag" Hotel, Penang Hill, 2200 ft., in March 1896.

Genus **GEHYRA**.

Gray, Zool. Misc. p. 57 (1842).

Digits strongly dilated, free or webbed at the base, with undivided or mesially divided transverse lamellæ beneath; distal phalanges free, elongate, compressed, clawed, raised from within the extremity of the dilated part; inner digit clawless or with a very indistinct retractile claw. Body with granular scales above, with imbricate flat scales beneath. Pupil vertical. Males with præanal or femoral pores.

Islands of the Indian Ocean to Australia and Islands of Pacific Ocean; Mexico. Three species in the Malay Peninsula.

Synopsis of the Species.

- I. Tail depressed, with angular, finely serrated lateral edge; digits with at least a rudiment of web.
 6 to 8 divided lamellæ under the median digits. *G. mutilata*, p. 47.
 3 or 4 divided lamellæ under the median digits *G. butleri*, p. 47.
- II. Tail subcylindrical; digits free, with the subdigital lamellæ undivided. *G. larutensis*, p. 48.

42. *Gehyra mutilata*.

Hemidactylus (Peropus) mutilatus, Wieg. N. Acta Ac. Leop.-Carol. xvii, p. 238 (1835).

Peripia peronii, Günth. Rept. Brit. Ind. p. 110 (1864).

Gehyra mutilata, Bouleng. Cat. Liz. i, p. 148 (1885); id. Faun. Brit. Ind., Rept. p. 96 (1890).

Body and limbs depressed; a fold of the skin bordering the hind limb posteriorly. Digits short, more or less webbed at the base; the inferior lamellæ angular, divided by a median groove, 6 or 8 under the median digits. Rostral with median cleft above, entering the nostril; 8 or 9 upper and 6 or 7 lower labials; symphysial moderately large, pentagonal; 3 pairs of chin-shields, inner very large, elongate, outer small, frequently broken up into small scales. Femoral pores in a doubly curved line, angular in the middle, 14 to 19 on each side. Tail depressed, normally with a sharpish, minutely serrately lateral edge. Greyish or buff above, sometimes nearly white, uniform or dotted or variegated with darker; young yellowish brown or purplish brown above, spotted with yellow and dark brown or black, and with a dark line on each side of the head.

From snout to vent 60 millim.; tail 60.

Mascarene Islands, Seychelles, Madagascar, Burma, Siam, Malay Peninsula and Archipelago, New Guinea, Western Mexico.

A common house gecko in Penang and Singapore. Less numerous in houses on the mainland of the Peninsula, but very common on the trunks of coco-palms.

43. *Gehyra butleri*.

Bouleng. Journ. Nat. Hist. Soc. Bombay, xiii, p. 333, pl. —, fig. 1 (1901); id. Fascic. Malay., Zool. i, p. 149 (1903).

Body elongate, limbs short. Digits with a rudiment of web, the basal part granulate beneath, the distal part strongly dilated, with curved or angular lamellæ; the 3 or 4 last of which are divided by a median groove; 7 lamellæ under the fourth toe. Rostral with median cleft above, entering the nostril; 8 upper and 6 or 7 lower labials; two pairs of elongate chin-shields. Tail depressed, with angular, finely serrated lateral edge. Reddish brown above, with whitish dots and three longitudinal series of

dark brown spots, or with round yellowish dark-edged spots; a dark streak on each side of the head, passing through the eye.

From snout to vent 32 millim.; tail 25.

Discovered by Mr. W. L. Butler at Kuala Lumpur; has since been found in the same locality by Messrs. Annandale & Robinson.

44. *Gehyra larutensis*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 188 (1900).

Body and limbs not much depressed. Digits free, strongly dilated, with entire lamellæ beneath, the largest of which are angulated or chevron-shaped and 3 or 4 in number under the median digits. Rostral with median cleft above, entering the nostril; 9 upper and 9 lower labials; symphysial truncate behind; a series of small chin-shields, the median pair largest, scarcely larger than the symphysial. Femoral pores in a long continuous series, 42 altogether. Tail subcylindrical. Grey-brown above and beneath; tail yellowish, with small darker spots on the back and a vertebral series of small blackish spots widely separated from each other; a dark line on each side of the head, passing through the eye.

From snout to vent 37 millim.; tail 32.

Known from a single specimen found under a house in the Larut Hills, Perak, at 3500 ft. altitude.

Lepidodactylus harterti, Werner, Zool. Anz. 1900, p. 196, from Malacca* (type in Berlin Museum) may prove to be identical with this species.

Genus *LEPIDODACTYLUS*.

Fitzing. Syst. Rept. p. 98 (1843).

Digits more or less dilated, free or with a rudiment of web, with mesially divided transverse lamellæ beneath, with very short, compressed distal clawed joint rising from the extremity of the dilated part; inner digit clawless. Body with granular scales above, with juxtaposed or imbricate flat scales beneath. Pupil vertical. Males with præanal or femoral pores.

South-Eastern Asia to Australia and Polynesia. Two species in the Malay Peninsula.

Inner digit rudimentary; tail cylindrical *L. ceylonensis*, p. 49.

Inner digit well developed; tail depressed, flat
beneath, with sharpish lateral edge *L. lugubris*, p. 49.

* Dr. Hartert collected on Gunong Inas, the type locality of *G. larutensis*, and this should, perhaps, be substituted for "Malacca," over 200 miles distant. On the continent Malacca is used as a general term embracing all places between Mergui and Singapore distant from each other over 800 miles.

45. *Lepidodactylus ceylonensis*.

Bouleng. Cat. Liz. i, p. 164, pl. xiii, fig. 3 (1885); id. Faun. Brit. Ind., Rept. p. 98 (1890); S. Flower, P. Z. S. 1896, p. 867; id. P. Z. S. 1899, p. 631; Annandale, Journ. Asiatic Soc. Bengal (2) i, p. 84 (1905).

Body elongate, limbs short. Digits free, inner rudimentary, the median with 4 or 5 angular, divided lamellæ. Rostral entering the nostril; 11 or 12 upper and as many lower labials; symphysial small, subtriangular; no chin-shields. Male with 8 præ-anal pores forming an angular series, and 7 or 8 femoral pores on each side. Tail cylindrical, covered with uniform small scales. Brown above, with small round yellowish spots; a dark streak from the tip of the snout to the shoulder, passing through the eye. Flower describes a Singapore specimen as dark brown above, spotted with brick-red and black, with light yellow spots on lips and behind eyes, purplish brown under the body, rusty brown and yellow, with minute black spots, under the tail.

From snout to vent 40 millim.; tail 34.

Originally described from Ceylon. Found also in Burma, the Malay Peninsula, Borneo, Java, and Engano. Two specimens were found by Capt. Flower in Government House, Singapore.

46. *Lepidodactylus lugubris*.

Platydictylus lugubris, Dum. & Bibr. Erp. Gén. iii, p. 304 (1836); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 622 (1847).
Peripia cantoris, Günth. Rept. Brit. Ind. p. 110 (1864).
Lepidodactylus lugubris, Bouleng. Cat. Liz. i, p. 165 (1885); id. Faun. Brit. Ind., Rept. p. 99 (1890).

Body and limbs moderately elongate. Digits with a rudiment of web, inner well developed; 7 or 8 angular, divided lamellæ under the fingers, 8 or 9 under the toes. Rostral entering the nostril; 11 to 13 upper and 10 or 11 lower labials; symphysial small; 4 transverse rows of small chin-shields. Femoral pores in a long series, angular in the middle, 25 to 30 altogether. Tail flat beneath, with sharpish, sometimes feebly serrated lateral edge; caudal scales small, flat, equal. Light pinkish grey or brownish above, usually with a series of small, black or purplish brown spots on each side of the vertebral line; a purplish-brown streak from the end of the snout to the ear, passing through the eye; labials usually finely dotted with brown; lower parts white.

From snout to vent 45 millim.; tail 40.

Burma, Andamans and Nicobars, Penang, Malay Archipelago, Papuasias, and Polynesias.

Genus **GECKO**.

Laurenti, Syn. Rept. p. 43 (1768).

Digits strongly dilated, free or webbed at the base, with undivided lamellæ below, with very short, compressed distal clawed joint rising from the extremity of the distal part; inner digit clawless. Body with granular scales and tubercles above, with small, flat, imbricate scales beneath. Pupil vertical. Males with præanal or femoral pores.

Eastern Asia. Three species in the Malay Peninsula:—

- I. Rostral not entering nostril; digits free;
males with præanal pores.
Width of head twice distance of end of snout to orbit; throat covered with small flat granules. *G. verticillatus*, p. 50.
Width of head not twice distance of end of snout to orbit; throat minutely granulate *G. stentor*, p. 51.
- II. Rostral entering nostril; digits with a rudiment of web; males with præanal and femoral pores *G. monarchus*, p. 51.

47. **Gecko verticillatus**.

Laur. op. cit. p. 44; Bouleng. Cat. Liz. i, p. 183 (1885); id. Faun. Brit. Ind., Rept. p. 102 (1890); S. Flower, P. Z. S. 1899, p. 631; Ridley, Journ. Straits Branch Asiat. Soc. No. 32, p. 193 (1899); Bouleng. Fascic. Malay., Zool. i, p. 149 (1903).

Platydyctylus gecko, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 623 (1847).

Gecko guttatus, Günth. Rept. Brit. Ind. p. 102 (1864).

Head twice as broad as distance from end of snout to orbit. Digits free. Rostral not entering nostril; 12 to 14 upper and 10 or 11 lower labials; 4 or 5 chin-shields on each side. Back covered with flat granules and about 12 longitudinal series of mammiform tubercles; throat covered with flat granules. 13 to 24 præanal pores forming an angular series. Tail slightly depressed, annulate, with large conical tubercles above, each annulus composed of 5 or 6 transverse rows of squarish scales above, and 3 beneath. Slaty grey above, with orange or red spots or vermiculations; tail with darker and lighter rings; whitish beneath, uniform or variegated with grey.

From snout to vent 160 millim.; tail 145.

Southern China to Malay Peninsula and Archipelago. Common on the trunks of coconut palms in the Patani States: found also in the Province Wellesley, at Singapore, and on Penang. Not known from the Federated Malay States. In Singapore it probably owes its introduction to man. In many places it frequents houses, and is known by the name of *Tokay*, which expresses its loud call. It is a bold and fierce Gecko, feeding not only on insects but on other lizards and mice, and is even supposed to catch small birds in trees at night.

48. *Gecko stentor*.

Platydictylus stentor, Cantor, Journ. Asiatic Soc. Bengal, xvi, p. 624 (1847).

Gecko stentor, Günth. Rept. Brit. Ind. p. 102, pl. xi, fig. A (1864); Bouleng. Cat. Liz. i, p. 184 (1885); id. Faun. Brit. Ind., Rept. p. 103 (1890); id. Fascic. Malay., Zool. i, p. 150 (1903).

Head not twice as broad as distance from end of snout to orbit. Digits free. Rostral not entering nostril; 12 to 14 upper and 10 to 12 lower labials; 3 to 5 chin-shields on each side. Back covered with very small granules and 10 to 12 longitudinal series of mammiform tubercles; throat covered with exceedingly small granules. 11 to 16 præanal pores. Tail as in the preceding species, but each annulus composed of 10 or 11 transverse rows of scales above, and 2 or 3 beneath. Brown or brownish grey above, marbled with darker, with or without transverse rows of whitish spots; sometimes a linear A-shaped dark brown mark on the head; tail with darker and lighter rings; lower surface whitish, generally dotted or variegated with greyish.

From snout to vent 190 millim.; tail 180.

Inhabits Burma, the Andamans, the Malay Peninsula, Sumatra, Borneo, and Java.

This Gecko, one of the largest known, was first discovered in Penang. It is common in the Malay jungle, especially in Upper Perak and the adjacent parts of Rhaman. It is usually found on high trees, is common in bamboo jungle, and rare in houses, where, however, its presence is considered very lucky.

49. *Gecko monarchus*.

Platydictylus monarchus, Dum. & Bibr. Erp. Gén. iii, p. 335 (1836); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 625 (1847).

Gecko monarchus, Günth. Rept. Brit. Ind. p. 103 (1864); Bouleng. Cat. Liz. i, p. 187 (1885); id. Faun. Brit. Ind., Rept. p. 103 (1890); S. Flower, P. Z. S. 1899, p. 635; Bouleng. Fascic. Malay., Zool. i, p. 150 (1903).

Head not twice as broad as distance from end of snout to orbit. Digits rather feebly dilated, with a rudiment of web. Rostral entering nostril; 10 or 11 upper and 9 or 10 lower labials; a large median pair of chin-shields bordered by a few irregular smaller shields. Back covered with very small granules, intermixed with numerous rounded conical tubercles; throat with very small granules. Præanal and femoral pores forming a long series, 16 to 20 on each side. Tail slightly depressed, annulate, covered above with very small flat granular scales and transverse series of conical tubercles. Brown or grey above, spotted with blackish, a double series of spots along the middle of the back being constant; tail with more or less marked darker and lighter rings; lower parts white.

From snout to vent 95 millim.; tail 110.

Ceylon, Malay Peninsula and Archipelago.

Very common in houses at Singapore; also recorded from Penang, Province Wellesley, Perak, Selangor, Kelantan.

Genus **PTYCHOZOON**.

Kuhl, in Fitzing. N. Class. Rept. p. 13 (1826).

Digits strongly dilated, entirely webbed, with undivided lamellæ below; all but the thumb and hallux with a compressed curved distal phalanx with retractile claw, originating a little before the extremity of the digital expansion. Limbs and sides of head, body, and tail with much developed membranous expansions. Body covered with granular scales above, with or without enlarged tubercles, below with small, slightly imbricate scales; the membrane on the side covered above with imbricate square scales arranged like the bricks of a wall, scaleless below. Pupil vertical. Males with præanal or præanal and femoral pores.

Burma, Malay Peninsula and Archipelago, Loo Choo Islands.

Two species:—

- Scales on side-lobes of head larger than largest ventrals; end of tail broadly expanded; male with præanal pores only *P. homalocephalum*, p. 52.
Scales on side-lobes of head not larger than largest ventrals; male with præanal and femoral pores *P. horsfieldii*, p. 53.

The so-called Flying Geckos, supposed to use the expansion of the side of the body as a parachute*, are inhabitants of the jungle, although exceptionally found about the dwellings of men. Mr. Robinson mentions a specimen having been caught by a native at Gunong Tahang, 3000 ft., in the act of flight from one tree trunk to another. The eggs are large, two in number.

50. Ptychozoon homalocephalum.

Lacerta homalocephala, Creveldt, Mag. Ges. Naturf. Fr. Berl. iii, p. 267, pl. viii (1809).

Ptychozoon homalocephalum, Cantor, Journ. As. Soc. Beng. xvi, p. 626 (1847); Günth. Rept. Brit. Ind. p. 105 (1864); Bouleng. Cat. Liz. i, p. 190 (1885); id. Faun. Brit. Ind., Rept. p. 104 (1890); S. Flower, P.Z.S. 1899, p. 635; Bouleng. Fascic. Malay., Zool. i, p. 150 (1903); Annandale, Ann. & Mag. Nat. Hist. (7) xv, p. 30 (1905); Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 64 (1908).

Rostral large, entering the nostril; 10 to 15 upper and 10 to 12 lower labials; symphysial small, subtriangular; 3 or 4 small chin-shields on each side, inner elongate. Back usually with scattered convex tubercles. Scales on side-lobes of head larger than the largest ventrals. Males with an angular series of 21 to 26 præanal pores; no femoral pores. Tail much depressed,

* "I have not the slightest doubt that the use of the structure is not to support the lizard in the air, but to assist it in concealing itself by causing it to fit better into its surroundings and be less conspicuous than it would be if its body cast a distinct shadow immediately beneath it." Annandale, Ann. & Mag. N. H. (7) xv, 1905, p. 31.

with scoloped lateral membrane, ending in a broad flap, the width of which equals or nearly equals that of the snout. Greyish or reddish brown above, with wavy dark brown transverse bands; a dark brown streak from the eye to the first dorsal band; lower parts yellow or yellowish.

From snout to vent 95 millim.; tail 92.

Burma, Malay Peninsula, Borneo, Sumatra, Java.

Specimens without the enlarged dorsal tubercles have been named by Annandale var. *lionotum*.



Fig. 15.—*Ptychozoon homalocephalum*.

51. *Ptychozoon horsfieldii*.

Pteropleura horsfieldii, Gray, Phil. Mag. (3) ii, p. 56 (1827).

Ptychozoon horsfieldii, F. Müll. Abh. Naturf. Ges. Basel, x, p. 209, pl. iv (1892); S. Flower, P. Z. S. 1899, p. 635.

Differs from the preceding in the following characters:—No enlarged tubercles on the back; scales on side-lobes of head not larger than largest ventrals; males with 7 to 12 præanal pores and 9 to 14 pores under each thigh; tail tapering, its extremity less than half width of snout.

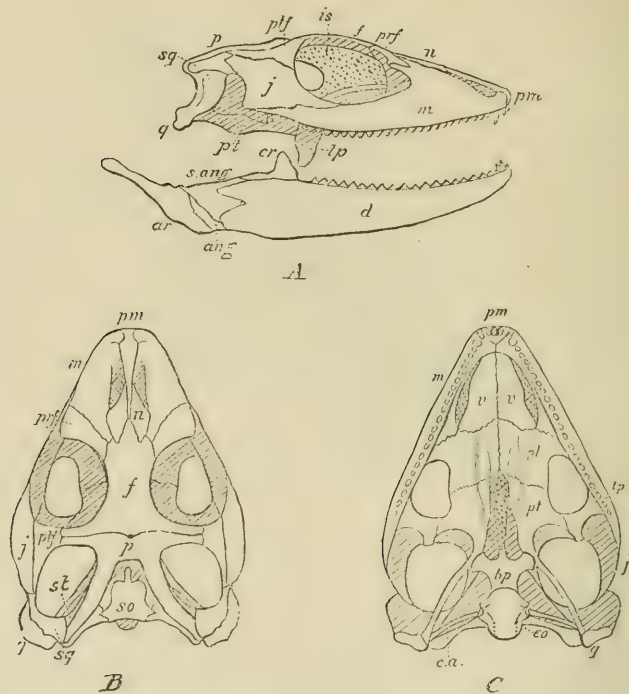
From snout to vent 80 millim.; tail 75.

Burma, Malay Peninsula, Borneo, Loo Choo Islands.

The type specimen is from Singapore, and Capt. Flower obtained a specimen on Penang Hill, at an altitude of 1900 ft.

Family AGAMIDÆ.

Skull with bony postorbital and postfronto-squamosal arches; supratemporal fossa not roofed over; præmaxillary single; nasals distinct; parietal single; a fibro-cartilaginous interorbital septum: a columella cranii. Teeth ankylosed to the parapet of the jaws (Acrodont dentition), usually unequal in size or divisible into incisors, canines, and molars; no teeth on the palate. Clavicle slender, not dilated; interclavicle T-shaped or anchor-shaped.

Fig. 16.—Skull of *Calotes jubatus*.

A. Side view.

B. Upper view.

C. Lower view.

ang. Angular.*ar.* Articular.*is.* Basisphenoid.*cr.* Coronoid.*d.* Dentary.*co.* Exoccipital.*f.* Frontal.*is.* Interorbital septum.*j.* Jugal.*m.* Maxillary.*n.* Nasal.*p.* Parietal.*pl.* Palatine.*pm.* Præmaxillary.*prf.* Præfrontal.*pt.* Pterygoid.*ptf.* Postfrontal.*q.* Quadrate.*s.ang.* Supra-angular.*so.* Supraoccipital.*sq.* Squamosal.*st.* Supratemporal.*tp.* Transpalatine.*v.* Vomer.

Tongue short, thick, not or but slightly nicked in front, villose. Eye small, pupil round; eyelids well developed. Scales usually imbricate, sometimes granular; no symmetrical shields on the top of the head; ornamental appendages, such as crests, gular pouches, &c., frequently present. Limbs well developed. Femoral pores absent in most of the genera. Tail usually long and not fragile.

Agamoids are mostly oviparous; eggs with parchment-like shell. Some are arboreal, others terrestrial. Inhabitants of Africa, Asia, and Australia.

Only six genera are known to have representatives in the Malay Peninsula.

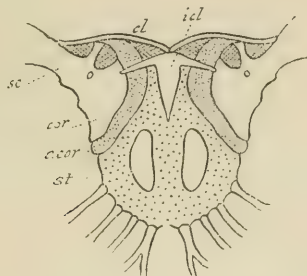


Fig. 17.—Pectoral arch of *Calotes jubatus*.

cl. Clavicle. *cor.* Coracoid. *icl.* Interclavicle. *st.* Sternum
e.cor. Epicoracoid. *sc.* Scapula.

Synopsis of the Genera.

I. No femoral pores.

A. Ribs much prolonged, supporting a wing-like dermal expansion DRACO, p. 56.

B. No wing-like lateral expansion; a dorsal denticulation or crest.

1. Tympanum hidden APHANIOTIS, p. 64.

2. Tympanum distinct.

A transverse gular fold; males with a gular sac GONYOCEPHALUS, p. 65.

No gular fold; no gular sac; dorsal scales small, heterogeneous ACANTHOSAURA, p. 68.

No gular fold; males with a more or less distinct gular sac; dorsal scales equal CALOTES, p. 69.

II. Femoral pores present; body depressed; scales very small; no dorsal crest. LIOLEPIS, p. 73.

Genus **DRACO**.

Linn. Syst. Nat. i, p. 358 (1766).

Body depressed, with a large lateral wing-like membrane folding like a fan, supported by the last five or six ribs which are much prolonged. A gular appendage and a lateral smaller one on each side. Tympanum distinct or covered with scales. Tail long. No femoral or preanal pores.

These lizards have often been represented as resting on a branch with outspread wings, as the parachute-apparatus is commonly called. According to Dr. P. Krefft's observations made at Singapore on living specimens of *D. volans*, the brightly coloured parachute is hardly ever unfolded except for the purpose of gliding through the air; when the lizard is at rest, or running, the parachute is closely folded against the body, giving the impression of a lizard emaciated by starvation or recent oviposition, but showing no trace of the brilliant coloration which adorns these membranes. Capt. Flower also observed that these lizards when at rest on the trunk of a tree are almost invisible, owing to their dark mottled-brown tint, the bright colour of the wings showing only when they dart through the air.

Distributed over the greater part of the Oriental Region. Eleven species are known from the Malay Peninsula.

Malay name, *Chi-chah teilang* (Flying Gecko).

Synopsis of the Species.

- I. Nostrils lateral, directed outwards; no caudal crest; upper labial shields not keeled.
- Tympanum exposed; hind limb not reaching beyond elbow of adpressed fore limb *D. volans*, p. 57.
- Tympanum scaly; hind limb reaching beyond elbow of adpressed fore limb *D. maculatus*, p. 58.
- II. Nostrils lateral, directed outwards; a caudal crest.
- Caudal crest feeble; gular appendage of male much longer than head *D. fimbriatus*, p. 59.
- Caudal crest strong; gular appendage of male not longer than head *D. punctatus*, p. 59.
- III. Nostrils lateral or more or less perfectly vertical; no caudal crest; upper labials keeled, 8 to 11; gular appendage of male translucent, covered with large scales.
- Nostrils lateral; fore limb reaching tip of snout or a little beyond *D. cyanolemus*, p. 60.
- Nostrils nearly vertical; fore limb reaching considerably beyond tip of snout; gular appendage of male much longer than head.. *D. blanfordii*, p. 61.
- Nostrils vertical; fore limb reaching considerably beyond tip of snout; gular appendage of male not or but little longer than head *D. formosus*, p. 61.

IV. Nostrils perfectly vertical; upper head-scales very small; 11 to 16 upper labials; gular appendage of male covered with small scales.

A. Tympanum exposed; snout shorter than orbit.

Hind limb reaching axilla or shoulder; gular appendage of male not or but little longer than head.

D. microlepis, p. 62.

Hind limb reaching axilla or not quite so far; gular appendage of male much longer than head.

D. melanopogon, p. 62.

B. Tympanum covered with scales; snout at least as long as orbit.

One or two transverse series of scales between nasal shield and rostral; no enlarged scale above tympanum; gular appendage of male much larger than head.

D. quinquefasciatus,

[p. 63.

Three (rarely two) transverse series of scales between nasal shield and rostral; a large pointed scale above tympanum; gular appendage of male not more than once and a half length of head.

D. maximus, p. 63.

52. *Draco volans*.

Linn. Syst. Nat. i, p. 358 (1766); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 643 (1847); Günth. Rept. Brit. Ind. p. 124 (1864); Bouleng. Cat. Liz. i, p. 256 (1885); S. Flower, P. Z. S. 1896, p. 868; Ridley, Journ. Straits Br. Asiat. Soc. No. 32, p. 191 (1899); Laidlaw, P. Z. S. 1901, i, p. 307.

Head small; snout not or but scarcely longer than diameter of orbit; nostril lateral, directed outwards; tympanum naked. Upper head-scales very unequal, strongly keeled; a more or less distinct Λ -shaped series of enlarged scales on forehead; a small subconical tubercle at posterior corner of orbit; 7 to 10 upper labials. Male's gular appendage longer than head. Male with a small nuchal crest. Dorsal scales irregular, keeled, largest at least twice as large as ventrals; a lateral series of distant enlarged scales. Fore limb extending beyond tip of snout, hind limb reaching elbow of adpressed fore limb, or not quite so far. No caudal crest. Light bronze brown above, with metallic reflections, and with spots and patches of reddish brown, dark brown, and black; a black spot between the orbits and another on the nape; wing-membranes orange above and blue beneath in the male, rich yellow above and greenish yellow beneath in the female, with black spots and marblings or irregular cross-bands; throat speckled with black; gular appendage yellow or orange in the male, blue or green in the female.

From snout to vent 85 millim.; tail 125.

Malay Peninsula, Lower Siam, Sumatra, Natuna Islands, Borneo, Palawan, Java, Celebes. Common in open plantations

in Wellesley Province, near Malacca, and at Singapore. Has also been found in Kedah, the Dindings, and on Penang; in fact, nearly all over the low-lying country. Specially abundant in coconut plantations on the islands near the East Coast of the Peninsula.

Capt. Flower has made the following observations on the habits of this *Draco*:—"These lizards when at rest on the trunk of a tree, usually in a vertical position, are almost invisible, owing to their dark mottled-brown colour, but when darting through the air overhead they resemble a flashing blue gem, owing to the bright colours of the underneath of the 'wings.' They are very active and nimble, spreading their parachute as they leap from any point, and alighting gently on all fours along it as they reach the ground. They can apparently direct their flight exactly. I have seen one slide through the air (with its wings quite steady) for a distance of about 20 yards, and then settle on the trunk of a tree." "Some of the females contained four rich-yellow-coloured leathery-skinned eggs about 5 by 4 millim." Mr. Laidlaw found only two or three eggs. Males appear to be more numerous than females.

53. *Draco maculatus*.

Dracunculus maculatus, Gray, Cat. Liz. p. 236 (1845).

Draco maculatus, Cantor, Journ. Asiatic Soc. Bengal, xvi, p. 645 (1847); Günth. Rept. Brit. Ind. p. 125, pl. xiii, fig. C (1864); Bouleng. Cat. Liz. i, p. 262 (1885); id. Faun. Brit. Ind., Rept. p. 112 (1890).

Draco haasei, Boettg. Zool. Anz. 1893, p. 424.

Head small; snout a little longer than diameter of orbit; nostril lateral, directed outwards; tympanum scaly. Upper head-scales unequal, strongly keeled; a compressed prominent scale on posterior part of supraciliary edge; 7 to 11 upper labials. Gular appendage of male very large, always much longer than, and frequently twice as long as head; female also with a well-developed but smaller appendage. Male with a very small nuchal crest. Dorsal scales little larger than ventrals, irregular, smooth or very feebly keeled; a lateral series of large trihedral keeled distant scales. Fore limb extending beyond tip of snout; hind limb reaching a little beyond elbow of adpressed fore limb, or axilla. No caudal crest. Greyish above, with more or less distinct darker markings; a more or less distinct dark interorbital spot; wing-membranes above with numerous small round black spots, which are seldom confluent, beneath immaculate or with a few black spots; a blue spot on each side of base of gular appendage.

From snout to vent 82 millim.; tail 115.

From Assam, Yunnan, and Tonkin, to Siam and Tenasserim; Penang; Singapore.

54. *Draco fimbriatus*.

Kuhl, Beitr. Zool. p. 101 (1820); Günth. Rept. Brit. Ind. p. 123 (1864); Bouleng. Cat. Liz. i, p. 265 (1885); id. Fascic. Malay., Zool. i, p. 151 (1903); id. Journ. Fed. Mal. St. Mus. iii, p. 64 (1908).
Draco abbreviatus, Gray, Zool. Journ. iii, p. 219 (1823).
Draco grandis, E. Bartlett, Crocod. Liz. Borneo, p. 83 (1895).

Head large; snout slightly longer than diameter of orbit; nostril lateral, directed outwards and slightly upwards; tympanum naked. Upper head-scales very small, keeled; a more or less distinct **A**-shaped series of enlarged scales on forehead; a conical tubercle at posterior corner of orbit; 10 to 13 upper labials. Gular appendage of male longer than head; female also with a well-developed, but shorter appendage. Male with a small nuchal crest. Dorsal scales smaller than ventrals, smooth or very feebly keeled; a lateral series of small subconical distant scales. Fore limb extending beyond tip of snout, hind limb reaching axil or nearly so far. A small caudal crest. Greyish above, marbled with reddish brown, with a few equidistant angular transverse dark markings, the anterior of which encloses a black interorbital spot; wing-membranes above dark brown with lighter lines, inferiorly dirty grey, immaculate or with a few scattered black spots; throat bluish, with a more or less marked dark network enclosing white spots; gular appendage red or salmon pink.

From snout to vent 108 millim.; tail 165.

Malay Peninsula, Sumatra, Natuna Islands, Borneo, Java.

A scarce species in the Malay Peninsula, usually found in lowland jungle, and not beyond 3000 feet altitude. I have examined specimens from Perak, Selangor, and Pahang.

55. *Draco punctatus*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 189 (1900); id. Fascic. Malay., Zool. i, p. 151, pl. x, fig. 1 (1903).

Head rather large; snout as long as diameter of orbit; nostril lateral, directed outwards; tympanum naked. Upper head-scales small, unequal, keeled; a **A**-shaped series of enlarged scales on the forehead; two conical, triangular, or spine-like tubercles on posterior part of supraciliary border; 10 or 11 feebly keeled upper labials. Male's gular appendage a little shorter than or hardly as long as head. Male with a very distinct nuchal crest. Dorsal scales unequal, feebly keeled, not larger than ventrals; a lateral series of enlarged, distant scales. Fore limb extending a little beyond tip of snout, hind limb reaching axil or not quite so far. Tail with a strong crest of long pointed scales. Greyish above, tinged with rusty on the crown and on the middle line of the back; back, and head above and beneath, with large black dots; four large dark blotches may form a cross between the shoulders; wing-membranes black above, streaked with whitish,

uniform whitish beneath; throat and belly pale blue; gular appendage and inner side of lateral wattles bright chrome-yellow.

From snout to vent 91 millim.; tail 156.

Malay Peninsula and Borneo. Discovered in the Larut Hills, Perak, at an altitude of 3000 feet, by Mr. A. L. Butler. A second specimen from Bukit Besar, Patani States, altitude 2500 feet, formed part of Messrs. Annandale & Robinson's collection

56. *Draco cyanolæmus*.

Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 64, pl. v, fig. 2 (1908).

Head small; snout as long as diameter of orbit; nostril lateral, directed outwards and slightly upwards; tympanum naked. Upper head-scales very unequal, keeled; 8 to 10 strongly keeled

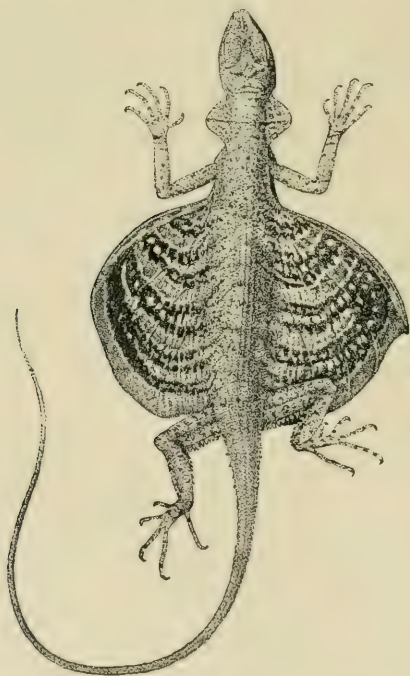


Fig. 18.—*Draco cyanolæmus*. (From Journ. F. M. S. Mus.)

upper labials. Gular appendage of male longer than head, thin, translucent, covered with very large scales, of female short. A slight nuchal fold. Dorsal scales subequal, smooth or faintly keeled, a little smaller than ventrals; a lateral series of distant enlarged scales. Fore limb reaching tip of snout or a little beyond, hind limb reaching axilla or not quite so far. No caudal

crest. Greyish above; wing-membranes above broadly edged with brick-red, with four more or less distinct black transverse bands spotted with white; white beneath, immaculate or with a few black spots near the body; throat blue or bluish, gular appendage yellow; male with the inner side of the lateral wattle red or orange, covering a large black spot.

From snout to vent 110 millim.; tail 195.

Malay Peninsula. First described from a single female specimen from Telôm, Perak-Pahang Boundary, altitude about 4000 feet. I have since referred to the same species two male specimens from the hills above the Semangko Pass, Selangor (3500 feet).

57. *Draco blanfordii*.

Draco major (non Laur.), Blanf. Journ. Asiatic Soc. Bengal, xlvii, p. 125 (1878).

Draco blanfordii, Bouleng. Cat. Liz. i, p. 207, pl. xx, fig. 7 (1885); id. Faun. Brit. Ind., Rept. p. 112 (1890); Boettg. Ber. Offenb. Ver. Nat. 1892, p. 100; Bouleng. Fascic. Malay., Zool. i, p. 153 (1903).

Head small; snout constricted above, with deeply concave loreal region, slightly longer than diameter of orbit; nostril directed upwards, but not perfectly vertical; tympanum naked. Upper head-scales unequal, keeled; a prominent tubercle at posterior corner of orbit; 9 or 10 keeled upper labials. Gular appendage of male much longer than head, thin, translucent, covered with very large scales. Male with a slight nuchal fold. Dorsal scales equal, smooth or very feebly keeled, not larger than ventrals; a lateral series of distant enlarged keeled scales. Fore limb extending considerably beyond tip of snout, hind limb reaching axilla or not quite so far. No caudal crest. Grey-brown above, with small dark spots; wing-membranes above marbled with dark brown, with lighter spots and lines, beneath immaculate; throat unspotted, greenish, pale scarlet beneath the lateral wattles.

From snout to vent 121 millim.; tail 235.

Tenasserim, Malay Peninsula, Junkceylon Island, Butang Islands.

Found in the Larut Hills, Perak, in Selangor, and in the Patani States and Trang, but not below 2500 feet in the more southern portions of the Peninsula.

58. *Draco formosus*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 190 (1900); id. Fascic. Malay., Zool. i, p. 152 (1903); id. Journ. Fed. Mal. St. Mus. iii, p. 65 (1908).

Head small; snout as long as or slightly longer than diameter of orbit; nostril vertical, directed upwards; tympanum naked. Upper head-scales unequal, keeled; 9 to 11 keeled upper labials. Gular appendage of male as long as head or a little longer, very thin, translucent, covered with very large scales. Nuchal fold

feeble or absent. Dorsal scales equal, smooth or very feebly keeled, not larger than ventrals; a lateral series of distant enlarged scales. Fore limb extending considerably beyond tip of snout, hind limb reaching axilla. No caudal crest. Brown above, head greyer, with dark spots, which may form bars on the nape and body; a black spot between the orbits and one or three on the nape; wing-membranes olive or pale gamboge above, edged with maroon or crimson, with five more or less regular, often indistinct transverse bands of blackish mottling, uncoloured beneath; throat of male, under the lappets and right to base of gular appendage, maroon or crimson, of female dark green.

From snout to vent 100 millim.; tail 200.

Malay Peninsula, Sumatra, and Borneo. Discovered by Mr. A. L. Butler on the Larut Hills, Perak, between 1500 and 3000 feet altitude. Has since been found in the Patani States, in Pahang, in Selangor from sea-level to an altitude of 3500 feet, in Sumatra, and in the interior of Sarawak.

A very close ally of this species is the Burmese-Siamese *D. taniopterus*, Gthr., a smaller lizard, in which the hind limb reaches beyond the axilla.

59. *Draco microlepis*.

Bouleng. P. Z. S. 1893, p. 523, pl. xlii, fig. 2.

Head small; snout shorter than diameter of orbit; nostril directed upwards, perfectly vertical; tympanum naked. Upper head-scales very small, keeled, subequal on snout; 11 to 14 upper labials. Gular appendage of male as long as head or a little longer, covered with moderately large scales. No nuchal fold or crest. Dorsal scales equal, keeled, a little smaller than ventrals; a lateral series of a few widely separated enlarged keeled scales. Fore limb extending with the whole hand beyond tip of snout, hind limb reaching axilla or shoulder. No caudal crest. Pale grey-brown above, with dark spots and marblings; wing-membranes above with black marblings forming five rather ill-defined transverse bands, beneath immaculate; base of gular appendage and inner surface of lateral wattles purplish red; a large black spot on each side of the base of the gular appendage in the male.

From snout to vent 80 millim.; tail 165.

Originally described from North Borneo. Has since been found on the Larut Hills, Perak, at 3500 ft. altitude.

60. *Draco melanopogon*.

Bouleng. Cat. Liz. iii, p. 492 (1887); Lindholm, Jahrb. Nass. Ver. liv, p. 26 (1901); Laidlaw, P. Z. S. 1901, i, p. 307; Bouleng. Fascic. Malay., Zool. i, p. 152 (1903).

Draco nigriappendiculatus, E. Bartlett, Crocod. Liz. Borneo, p. 82 (1895).

Head small; snout shorter than diameter of orbit; nostril directed upwards, vertical; tympanum naked. Upper head-scales

very small, keeled, subequal on snout; 11 to 15 more or less distinctly keeled upper labials. Gular appendage of male much longer than head, covered with moderate scales, of female small. No nuchal fold or crest. Dorsal scales equal, smooth or feebly keeled, a little smaller than ventrals; a lateral series of a few distant enlarged keeled scales. Fore limb extending far beyond tip of snout, hind limb reaching axilla or not quite so far. Brown above, with more or less distinct darker marblings or irregular cross-bands; wing-membranes black above, with rich yellow spots, colourless beneath; breast, and often also belly, with brown spots; gular appendage of male black, of female grey.

From snout to vent 80 millim.; tail 145.

Malay Peninsula, Sumatra, Natuna Islands, Borneo.

Originally described from Malacca. I have since examined specimens from Bukit Besar, Patani States, Kuala Lumpur, and Kelantan. Next to *D. volans* it is the commonest species in the Peninsula and takes its place in jungle country.

61. *Draco quinquefasciatus*.

Gray, Zool. Journ. iii, p. 219 (1827); Günth. Rept. Brit. Ind. p. 126 (1864); Bouleng. Cat. Liz. i, p. 269, pl. xx, fig. 8 (1885); id. Ann. & Mag. Nat. Hist. (6) viii, p. 288 (1891).

Head small; snout as long as or longer than diameter of orbit; nostril vertical, directed upwards; tympanum scaly. Upper head-scales very small, subequal, keeled; 11 to 15 more or less distinctly keeled upper labials. Gular appendage of male much longer than head, covered with small scales, of female very short. A slight nuchal fold in the male. Dorsal scales equal, smooth or feebly keeled, not larger than ventrals; a more or less distinct lateral series of distant enlarged scales. Fore limb extending more or less beyond tip of snout, hind limb to elbow of adpressed fore limb or a little beyond. No caudal crest. Reddish-brown above, usually dotted all over with darker; wing-membranes red above, with five regular curved black bands as broad as the bright interspaces between them, inferiorly with or without much narrower black bands occupying the same position; the dark bands of the wing-membranes may extend across the body; a black band across the neck, behind the gular appendage; throat grey, dotted with brown.

From snout to vent 105 millim.; tail 160.

Malay Peninsula and Borneo. First discovered in Penang; has since been recorded from Selangor by Dr. Hanitsch. I have examined specimens from near Kuala Lumpur in Selangor, and from Kelantan. Occurs also in the Butang Islands and Trang.

62. *Draco maximus*.

Bouleng. P. Z. S. 1903, p. 522, pl. xlii, fig. 1; Robinson, Journ. Straits Branch Asiat. Soc. No. 44, p. 223 (1905).

Head small; snout as long as diameter of orbit; nostril

vertical, directed upwards; tympanum scaly. Upper head-scales very small, almost granular, keeled; three (rarely two) transverse series of scales between nasal shield and rostral; snout often with a Λ -shaped series of enlarged scales; a large erect pointed scale above the tympanum; 14 to 16 upper labials. Gular appendage of male not more than once and a half length of head, covered with small or moderate scales, of female small. A slight nuchal fold in the male. Dorsal scales equal, keeled, a little smaller than ventrals; a few widely separated enlarged scales may be present on each side of the body. Fore limb extending beyond tip of snout, hind limb reaching axilla. No caudal crest. Greyish above, often dotted with black, with more or less distinct wavy cross-bands; wing-membranes dark brown or black above, with light longitudinal streaks, colourless beneath; throat of male speckled with black, with a black transverse band behind, of female black with white spots; gular appendage of male red.

From snout to vent 145 millim.; tail 225.

The largest species of the genus.

Malay Peninsula, Natuna Islands, Borneo.

The only specimen I have seen from the Malay Peninsula was obtained near Kuala Lumpur. This was one of a pair from Klang Gates, recently obtained, which, with a third from the same locality, are the only examples known from this region.

Genus **APHANIOTIS**.

Peters, Mon. Berl. Ac. 1864, p. 385.

Tympanum hidden. Body compressed. Dorsal scales small, intermixed with larger ones. A dorsal denticulation or crest. No gular fold, no gular pouch. No præanal or femoral pores.

Malay Peninsula and Archipelago.—Two species, one of which inhabits the Malay Peninsula.

63. **Aphaniotis fusca.**

Otocryptis (Aphaniotis) fusca, Peters, l. c.

Aphaniotis fusca, Laidlaw, P. Z. S. 1901, i, p. 307; Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 65 (1908).

Snout rounded, as long as, or slightly longer than diameter of orbit, with sharp canthus rostralis; upper head-scales sharply keeled; 8 upper and as many lower labials. Scales keeled, ventrals larger; a feeble denticulation along nape and back. Limbs very long and slender, adpressed hind limb reaching end of snout; fifth toe as long as third. Tail cylindrical, very long and slender. Brown, lighter beneath; limbs often with a few light patches. Inside of mouth pale cobalt blue.

From snout to vent 60 millim.; tail 150.

Throughout the mainland of the Malay Peninsula, Borneo, Natunas. Found sparingly almost everywhere in jungle country up to about 3000 feet.

Genus **GONYOCEPHALUS.**

Kaup, Isis, 1825, p. 590.

Tympanum distinct. Body compressed. Dorsal scales small, uniform or intermixed with larger ones. A dorsal crest, more developed in the male than in the female. A strong transverse gular fold distinct at least on the sides. Male with a gular sac. No præanal or femoral pores.

From Bengal and Burma to Papuasias and North-Eastern Australia.

Four species in the Malay Peninsula.

Mr. Robinson has repeatedly observed the curiously sluggish habits of the adult, making no efforts to escape when seized, though biting viciously; young individuals, however, are exceedingly active and difficult to capture.

Synopsis of the Species.

- I. Enlarged scales scattered on the sides; nuchal and dorsal crests continuous, very high in the male; fourth finger slightly longer than third.

Dorsal, gular, and ventral scales keeled *G. borneensis*, p. 65.
Dorsal and gular scales smooth, ventrals smooth or faintly keeled *G. herveyi*, p. 66.

- II. No enlarged scales on the sides.

Nuchal and dorsal crests very high in the male, separated by a notch; gular and ventral scales smooth; third and fourth fingers equal; tympanum naked *G. grandis*, p. 66.

Nuchal and dorsal crests continuous, the latter low; gular scales smooth, ventrals keeled; fourth finger slightly longer than third; tympanum partly covered with scales. *G. robinsonii*, p. 67.

64. Gonyocephalus borneensis.

Lophyrus borneensis, Schleg. Bijdr. tot de Dierk. i, p. 6, pl. iii, fig. 2 (1848).

Gonyocephalus borneensis, Bouleng. Cat. Liz. i, p. 288 (1885); id. op. cit. iii, p. 493 (1887); id. Fascic. Malay., Zool. i, p. 153 (1903); id. Journ. Fed. Mal. St. Mus. iii, p. 65 (1908).

Tympanum smaller than eye-opening; upper head-scales small, keeled; 9 to 12 upper and as many lower labials; gular sac moderately large; gular scales keeled. Nuchal and dorsal crests continuous, formed of long slender lobes, which are longest on the nape (as long as snout in the male), and generally decrease in size on the back, with smaller keeled scales at the base. Dorsal scales small, obtusely keeled, the points directed upwards and backwards, with a few enlarged scattered scales on the sides;

ventral scales larger, keeled. Limbs above with large keeled scales; fourth finger slightly longer than third; adpressed hind limb not quite reaching tip of snout. Tail compressed, with serrated upper edge at the base. Olive or brownish above, sides sometimes speckled with black; in females and young sides with blackish reticulation and a dark bar on each side of nape; enlarged dorsal scales usually whitish; gular sac of male bluish in the middle with an orange red patch on each side; gular fold black; belly white or yellowish; tail with dark brown or black annuli.

From snout to vent 130 millim.; tail 275.

Borneo, Malacca, Semangko Pass (Selangor-Pahang border, 2700 feet), Maxwell's Hill, Perak (3600 feet); not uncommon at Kuala Teku, Pahang (500 feet), but difficult to detect in the deep jungle in which it lives.

65. *Gonyocephalus harveyi*.

Bouleng. Cat. Liz. iii, p. 493 (1887); id. Fascic. Malay., Zool. i, p. 153 (1903).

Tympanum slightly smaller than ear-opening; upper head-scales small, unequal in size, bluntly keeled; a few enlarged tubercles above and below the tympanum; 10 to 12 upper and 10 lower labials; gular sac moderately large; gular scales smooth. Nuchal and dorsal crests continuous, formed of long slender lobes which are longest on the nape (longer than snout in full-grown male), and generally decrease in size on the back, with smaller smooth scales at the base. Dorsal scales small, smooth, the points directed upwards and backwards, with a few enlarged scales scattered on the sides; ventral scales larger, smooth or faintly keeled. Limbs above with large, very faintly keeled scales; fourth finger slightly longer than third; adpressed hind limb reaching tip of snout. Tail compressed, with serrated upper edge at the base. Olive or brownish above, back of head and nape sometimes with blackish vermiculations; females and young with dark cross-bars on body and limbs; enlarged tubercles on the sides usually whitish; lower parts whitish, gular fold blackish, the gular region with dark longitudinal lines in the young; tail with dark brown or black annuli.

From snout to vent 145 millim.; tail 310.

Malacca; Batang Padang, S. Perak; Natuna Islands.

66. *Gonyocephalus grandis*.

Dilophyrus grandis, Gray, Cat. Liz. p. 239 (1845); Cantor, Journ. Asiat. Soc. Beng. xvi, p. 640, pl. xx (1847); Günth. Rept. Brit. Ind. p. 136 (1864).

Gonyocephalus grandis, Bouleng. Cat. Liz. i, p. 298 (1885); id. Faun. Brit. Ind., Rept. p. 124 (1890); id. Fascic. Malay., Zool. i, p. 153 (1903).

Tympanum nearly as large as eye-opening; upper head-scales

very small, bluntly keeled; one or two enlarged tubercles on each side behind occiput; 10 to 13 upper and as many lower labials; gular sac moderately large; gular scales smooth. Nuchal and dorsal crests subcontinuous, separated by a deep notch, composed of long lanceolate spines in the male, united together, free only at the tips, with smaller triangular smooth scales at the base; greatest height of nuchal crest often nearly equal to or exceeding length of snout; crest very low in the female, reduced to a mere serration. Dorsal scales very small, equal, the points directed upwards and backwards; ventral scales rather small, smooth. Limbs above with equal, smooth or very feebly keeled scales; third and fourth fingers equal; adpressed hind limb reaching to between eye and tip of snout. Tail strongly compressed, with sharp serrated upper edge. Brown or olive above, with or without darker cross bands; flanks with roundish yellow spots; female and young with a dark, light-edged band behind eye, meeting, or nearly meeting, its fellow on scapular region.

From snout to vent 155 millim.; tail 405.

Rangoon (?), Malay Peninsula, Borneo, Sumatra, Nias, Mentawai. I have examined specimens from Penang, Batang Padang (Perak), and Sungei Kongkoi (Jebebu, 1200 feet).

67. *Gonyocephalus robinsonii*.

Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 65, pl. v (1908).

Tympanum smaller than eye-opening, partly covered with



Fig. 19.—*Gonyocephalus robinsonii*. (From Journ. F. M. S. Mus.)

scales; upper head-scales small, keeled, unequal in size; an enlarged tubercle behind superciliary edge and others on occiput

and temple (these tubercles less distinct in the young); 10 upper and 8 lower labials; gular sac large; gular fold distinct only on the sides; gular scales very small, smooth or obtusely keeled. Nuchal crest formed of large triangular lobes, in contact with each other at the base; the crest continuous with the dorsal, the lobes of which are much smaller and gradually decrease in size. Dorsal scales small, equal, obtusely keeled, the points directed upwards and backwards, very small on the flanks; ventral scales larger, sharply keeled. Limbs above with large, equal, keeled scales; fourth finger slightly longer than third; adpressed hind limb reaching anterior border of eye. Tail compressed, with serrated upper edge at the base. Greyish olive above, with four oblique; blackish bars on each side; eyelids black; a black bar from eye to ear; an oblique black bar in front of the shoulder; whitish beneath.

From snout to vent 152 millim.; tail 320.

The type specimen was obtained on the side of the final peak of Gunong Tahan, altitude 5200 feet. I have since examined a young specimen from the mountains of the Selangor main range, between 2000 and 3000 feet, preserved in the Selangor Museum.

This aberrant species connects *Gonyocephalus* with *Calotes*.

Genus **ACANTHOSAURA**.

Gray, Griff. A. K. ix, Syn. p. 56 (1831).

Tympanum distinct. Body usually compressed, covered with unequal-sized scales. A dorso-nuchal crest. No gular fold, no gular sac. No præanal or femoral pores.

South-Eastern Asia. Two species in the Malay Peninsula:—

Postorbital and nuchal spines at least $\frac{3}{4}$ diameter of orbit	<i>A. armata</i> , p. 68.
Postorbital and nuchal spines not more than $\frac{1}{2}$ diameter of orbit	<i>A. crucigera</i> , p. 69.

68. **Acanthosaura armata**.

Agama armata, Gray, Zool. Journ. iii, p. 216 (1827).

Lophyrus armatus, Cantor, Journ. Asiat. Soc. Beng. xvi, p. 638 (1847).

Acanthosaura armata, Günth. Rept. Brit. Ind. p. 148 (1864); Bouleng. Cat. Liz. i, p. 301, pl. xxii, fig. 1 (1885); id. Faun. Brit. Ind., Rept. p. 125 (1890); S. Flower, P.Z. S. 1899, p. 638; Bouleng. Fascic. Malay., Zool. i, p. 153 (1903).

Snout as long as or slightly shorter than diameter of orbit; canthus rostralis angular; upper head-scales keeled, much larger on supra-orbital region; a long spine ($\frac{3}{4}$ to 1 diameter of orbit) behind superciliary edge; 11 to 13 upper and 12 to 15 lower labials; tympanum nearly as large as eye-opening; gular scales strongly keeled, much smaller than ventrals. An oblique fold in front of shoulder. A long spine on each side of nape, above

tympanum. Nuchal crest not continuous with dorsal, composed of large compressed spines, with the base concealed under two or three rows of smaller spines; dorsal crest as high as or a little lower than nuchal in front, becoming very low behind; the crest less developed in females. Dorsal scales extremely small, intermixed with enlarged, rhomboidal, strongly keeled scales; ventral scales a little larger than enlarged dorsals, strongly keeled. Hind limb reaching between temple and nostril. Tail compressed. Colour very changeable, brown, blackish, or green, with lighter or darker spots; dark lines radiating from the eye; sky-blue spots may be present on the body, limbs, and tail; a dark brown or black band from the interspace between the nuchal and dorsal crests to the sides of the throat; yellow beneath tinged with orange on the chest; gular region of male pale lilac; inside of mouth bright orange.

From snout to vent 135 millim.; tail 160.

Cochin China, Siam, Tenasserim, Malay Peninsula, and Penang. Obtained by Dr. Annandale at Bukit Besar, Patani States, 2500 feet.

Feeds on worms, which it digs out with its fore limbs. This lizard has considerable power of changing colour; when angry it distends its throat. It is somewhat rare on the mainland, but is fairly numerous on many of the small islands on both coasts of the Peninsula.

69. *Acanthosaura crucigera*.

Bouleng. Cat. Liz. i, p. 302, pl. xxii, fig. 2 (1885); id. Faun. Brit. Ind., Rept. p. 125 (1890).

Distinguished from the preceding by the shorter spines, the postorbital and nuchal not measuring more than half the diameter of the orbit, and the somewhat larger dorsal scales.

Originally described from Tenasserim. A female specimen measuring 140 millim. from snout to vent, from Larut, Perak, is preserved in the Perak Museum, and has been submitted to me by Mr. L. Wray.

Genus **CALOTES**.

Cuvier, Règne Anim. ii, p. 35 (1817).

Tympanum distinct. Body compressed, covered with equal-sized scales. A more or less distinct dorso-nuchal crest. A more or less developed gular sac in the male; no transverse gular fold, or a very feebly marked one. Tail round or feebly compressed. No femoral or præanal pores.

Arboreal or subarboreal lizards inhabiting South-Eastern Asia. Four species in the Malay Peninsula.

Some of these lizards change colour as rapidly as chameleons. The eggs are large, elongate, spindle-shaped.

Synopsis of the Species.

I. No fold in front of the shoulder.

- A. Lateral scales pointing backwards and downwards; more than 50 scales round the body.

Dorsal scales larger than ventrals. *C. floweri*, p. 70.

Dorsal scales smaller than ventrals *C. cristatellus*, p. 70.

- B. Lateral scales pointing backwards and upwards; less than 50 scales round the body.

C. versicolor, p. 71.

II. An oblique curved fold in front of the shoulder; a long spine behind supraciliary edge, and two others above ear.

C. emma, p. 72.

70. *Calotes floweri*, sp. n.

Calotes microlepis (non Bouleng.) Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 66 (1908).

Upper head-scales unequal-sized, keeled, without tubercles or spines; tympanum about half diameter of orbit. Gular pouch not developed; gular scales feebly keeled, smaller than ventrals. No fold in front of shoulder. Nuchal crest formed of 6 to 8 small spines; dorsal crest quite indistinct. 53 scales round middle of body; dorsals keeled, directed backwards, laterals larger, smooth or feebly keeled, directed downwards and backwards, ventrals smaller, strongly keeled. Hind limb reaching axilla; third and fourth fingers equal, about as long as fifth toe. Tail moderately compressed. Grey or brown above, with three large dark patches on each side of the body, which may unite across the back to form cross-bands; dark lines radiating from the eye.

From snout to vent 98 millim.; tail 180.

Siam and Malay Peninsula. A specimen of this species, referred to *C. microlepis*, which differs in the narrower head, smaller scales (65 round the body) not distinctly keeled on the sides, and the more compressed tail, was obtained by Capt. Flower at Chantaboon, and two at Gunong Tahan (6500 and 6200 feet) by Mr. Robinson, who observes that this is one of the highest ranging Vertebrates on Gunong Tahan. These two specimens were caught one on a rock and the other among low vegetation. They had little, if any, power of colour change.

71. *Calotes cristatellus*.

Agama cristateila, Kuhl, Beitr. Zool. vergl. Anat. p. 108 (1820).

Bronchocela cristatella, Cantor, Journ. Asiat. Soc. Beng. xvi, p. 636 (1847); Günth. Rept. Brit. Ind. p. 138 (1864).

Calotes cristatellus, Bouleng. Cat. Liz. i, p. 316 (1885); id. Faun. Brit. Ind., Rept. p. 134 (1890); S. Flower, P. Z. S. 1896, p. 871; id. op. cit. 1899, p. 639; Ridley, Journ. Straits Br. Asiat. Soc. No. 32, p. 191 (1899); Bouleng. Fascic. Malay., Zool. i, p. 154; id. Journ. Fed. Mal. St. Mus. iii, p. 66 (1908).

Malay name, *Sumpa-sumpa*.

Upper head-scales rather small, keeled, slightly enlarged on supraocular region; a few more or less distinct, erect, compressed

scales behind supraciliary edge; tympanum half, or more than half, diameter of orbit. Gular pouch very small; gular scales keeled, smaller than ventrals. No fold in front of shoulder. Nuchal crest composed of erect compressed spines, the longest never equalling diameter of orbit; dorsal crest a mere serrated ridge. 57 to 120 keeled scales round middle of body; dorsal scales much smaller than ventrals, upper directed upwards and backwards, laterals downwards and backwards. Hind limb reaching between eye and tip of snout; third and fourth fingers equal or nearly so, about as long as fifth toe. Tail round, subtriangular at base. Green, uniform or with reddish or dark brown markings, changing rapidly to yellowish, grey-brown, dark brown or blackish; in April, according to Flower, the lips, cheeks, and throat of the males assume golden, red, and crimson shades.

From snout to vent 130 millim.; tail 440.

Tenasserim, Malay Peninsula and Archipelago; common everywhere.

This species, according to Annandale, is rather less active than *C. versicolor*, and often sits quite motionless on tree-trunks, with its hind and fore quarters raised from the surface to which it clings. This is the "Chameleon" of Europeans in the Peninsula.

72. *Calotes versicolor*.

Agama versicolor, Daud. Hist. Rept. iii, p. 395, pl. xlv (1802).

Calotes versicolor, Günth. Rept. Brit. Ind. p. 140 (1864); Bouleng. Cat. Iiz. i, p. 135 (1885); id. Faun. Brit. Ind., Rept. p. 135, fig. 42 (1890); S. Flower, P. Z. S. 1896, p. 872; id. op. cit. 1899, p. 639; Bouleng. Fascic. Malay., Zool. i, p. 154 (1903).

Upper head-scales rather large, smooth or feebly keeled, imbricate, more or less enlarged on supraorbital region; two well-separated spines (seldom absent or scarcely distinct) on each side of the back of the head, above the ear; tympanum half, or less than half, diameter of orbit. Gular pouch feebly developed; gular scales smooth or feebly keeled, as large as ventrals or larger, larger and mucronate in the adult male. No fold in front of shoulder. Dorso-nuchal crest well developed in the male, composed of lanceolate spines gradually decreasing in size on posterior part of body. 35 to 57 scales round middle of body, dorsals more or less distinctly keeled, larger than ventrals, all directed upwards and backwards; ventral scales strongly keeled. Hind limb reaching temple or eye; fourth finger a little longer than third. Tail round; brownish or yellowish, uniform or with dark transverse bands or spots, or dark olive-brown with light spots or longitudinal lines; belly sometimes with dark longitudinal lines. The male assumes brilliant colours (red, yellow, and black) during the breeding season.

From snout to vent 95 millim.; tail 280.

India and Ceylon, Baluchistan, and from Southern China to the Malay Peninsula. Very abundant in Trang, the Patani

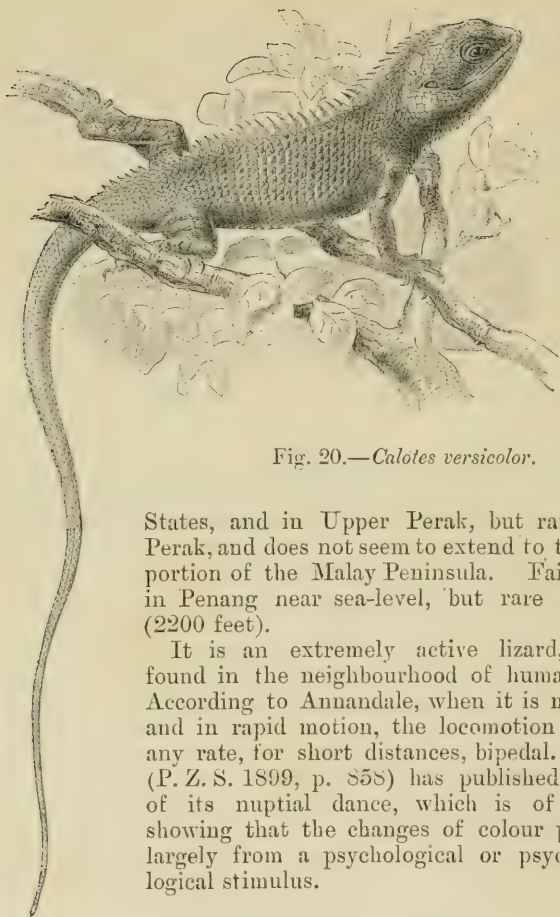


Fig. 20.—*Calotes versicolor*.

States, and in Upper Perak, but rare in South Perak, and does not seem to extend to the Southern portion of the Malay Peninsula. Fairly common in Penang near sea-level, but rare in the hills (2200 feet).

It is an extremely active lizard, principally found in the neighbourhood of human dwellings. According to Annandale, when it is much excited and in rapid motion, the locomotion becomes, at any rate, for short distances, bipedal. Annandale (P. Z. S. 1899, p. 858) has published an account of its nuptial dance, which is of interest as showing that the changes of colour proceed very largely from a psychological or psychico-physiological stimulus.

73. *Calotes emma*.

Gray, Cat. Liz. p. 244 (1845); Günth. Rept. Brit. Ind. p. 144 (1864); Bouleng. Cat. Liz. i, p. 324, pl. xxv, fig. 1 (1885); id. Faun. Brit. Ind., Rept. p. 137 (1890); id. Fascic. Malay., Zool. i, p. 155 (1903).

Upper head-scales imbricate, keeled, considerably enlarged on supraorbital region; a long spine, surrounded by small ones, behind supraciliary edge, and two others on each side between tympanum and nuchal crest. No well-developed gular pouch; gular scales keeled, as large as ventrals or a little larger. A very strong oblique curved fold in front of shoulder. Nuchal crest composed of long lanceolate spines, soon decreasing in size, the dorsal crest reduced to a feebly serrated ridge. 51 to 55 scales

round middle of body; dorsal scales keeled, all directed upwards and backwards; ventral scales smaller, strongly keeled. Hind limb reaching eye; third and fourth fingers nearly equal. Tail slightly compressed. Pale sage green to olive, with transverse dark brown bands which are interrupted by a more or less strongly defined whitish lateral band; blackish lines radiating from the eye; the fold in front of the shoulder black: male with the skin and base of scales on gular pouch dark crimson lake.

From snout to vent 90 millim.; tail 240.

Khasi and Kakhyen Hills, Pegu, Tenasserim, Mergui, Siam. In the Malay Peninsula, known from Trang and the Patani States, and recently met with at Parit on the Perak River, south of which it has not been found. A jungle-loving lizard.

Genus **LIOLEPIS.**

Cuvier, Règne An., 2nd ed. ii, p. 37 (1829).

Body depressed; skin of sides lax, expansible; no crest; scales very small. Tympanum distinct. No gular pouch; a strong transverse gular fold. Tail long, rounded, feebly depressed. Femoral pores.

South-Eastern Asia. A single species.

74. *Liolepis belliana*.

Uromastix belliana, Gray, Zool. Journ. iii, p. 220 (1827).

Leiolepis bellii, Cantor, Journ. Asiat. Soc. Beng. xvi, p. 647 (1847).

Liolepis guttatus, Günth. Rept. Brit. Ind. p. 154 (1864).

Liolepis belliana, Bouleng. Cat. Liz. i, p. 403 (1885); id. Faun.

Brit. Ind., Rept. p. 156 (1890); S. Flower, P. Z. S. 1899, p. 642;

Ridley, Journ. Straits Br. Asiat. Soc. No. 32, p. 191 (1899);

Bouleng. Fascic. Malay., Zool. i, p. 155, pl. x, fig. 2 (1903).

Malay name, *Biawak pasir*.

Head rather small, snout short; tympanum large, vertically oval; upper head-scales small and sharply keeled on snout and interorbital region, minute and granular on supraorbital region and occiput. Gular scales small, granular; a series of chin-shields on each side, parallel with the lower labials. Side of neck plicate; a more or less distinct fold along side of body. Dorsal scales minute, granular, feebly keeled, ventrals larger, subimbricate, smooth. Hind limb reaching neck or tympanum; 14 to 21 femoral pores on each side. Tail covered with small, equal, keeled scales. Adult grey, olive-green, brownish, or blackish above, with yellow black-edged spots which may form ocelli or be confluent into longitudinal bands; sides with black or dark blue and orange vertical bars; lower parts yellow, or greyish, uniform or variegated with black or blue. Young blackish above, with five yellow longitudinal lines, the median bifurcating on the nape; tail bright brick-red.

From snout to vent 170 millim.; tail 330.

Southern India; Southern China to Malay Peninsula. This lizard is partly insectivorous, partly herbi- and frugivorous. It has the power of expanding its flanks in a sort of wing, which foreshadows the parachute of the Dragons; as observed by Cantor, fear or anger will cause a momentary expansion, as with the hood of the Cobra. It is terrestrial and a burrower; a specimen was taken by Mr. Robinson climbing a tree-trunk, but this is a most unusual position. According to Dr. Annandale it is monogamous, a single pair inhabiting a burrow, which may be shared by several young ones. In spite of its rather heavy build it can run very quickly.

In the Malay Peninsula it is on record from Perlis, Prov. Wellesley, Patani States, Jalor, Kelantan, Trengganu, and Pahang, in sandy localities. Common on the Langkawi group and the Dindings, and also found on the coast of Negri Sembilan and on islands near the town of Malacca.

Family VARANIDÆ.

Skull with incomplete postorbital and complete post-fronto-squamosal arches; supratemporal fossa not roofed over; premaxillary single, narrowed and much produced posteriorly; nasals coalesced, narrow; parietal single; frontals completely surrounding the olfactory lobes of the brain; a fibro-cartilaginous interorbital septum; a columella cranii. Teeth large, dilated at the base, which is fixed to the inner side of the jaws; palate toothless. Clavicle slender, not dilated; interclavicle anchor-shaped.

Tongue smooth, very long and slender, bifid, retractile into a sheath at the base, similar to that of Snakes. Pupil round; eyelids well developed. Head covered with small juxtaposed scales; back with roundish granular scales surrounded by rings of minute granules; ventral scales quadrangular, arranged in transverse series. Neck long. Limbs well developed, strong. Tail long, not fragile.

Lizards mostly of large size, carnivorous, terrestrial or semi-aquatic. Lay oval, soft-shelled eggs.

A single genus.

Genus VARANUS.

Merrem, Tent. Syst. Amph. p. 58 (1820).

Body elongate, limbs well developed, strong; neck long; tail long, usually compressed. Head covered with small scales. Dorsal scales roundish or oval, juxtaposed, surrounded by rings

of minute granules; ventral scales squarish, arranged in transverse series. Femoral and præanal pores usually absent.

Inhabit Africa, Southern Asia, Papuasias, and Australia. Five species in the Malay Peninsula.

Malay name, *Biawak*.

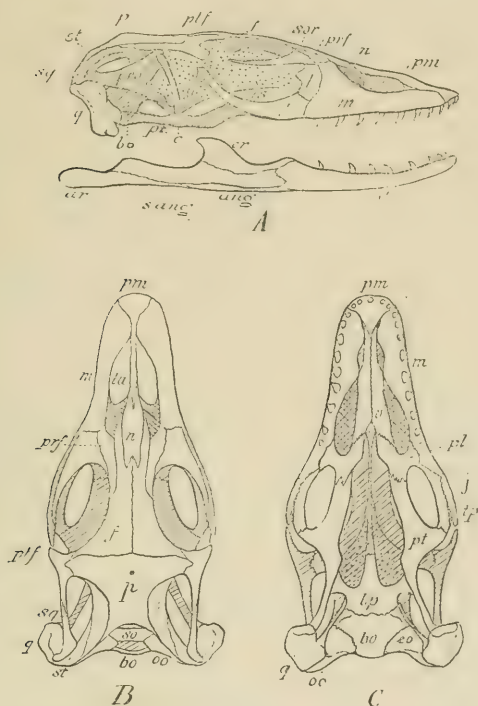


Fig. 21.—Skull of *Varanus griseus*.

A. Side view.

B. Upper view.

C. Lower view.

ang. Angular.

ar. Articular.

60. Basioccipital.

bp. Basisphenoid.

c. *Columella cranii*.

cr. Coronoid.

d. Dentary.

co. Exoccipital.

f. Frontal.

is. Interorbital septum.

१. Jugal.

l. Lachrymal.

iii. Maxillary.

n. Nasal.

00. Opisthotic.

p. Parietal.

pl. Palatine.

pm. Præmaxillary.

pro. Prootic.

prf. Præfrontal.

pt. Pterygoid.

ptf. Postfrontal.

q, Quadrate.

s. ang. Supra-angular.

so. Supraoccipital.

cor. Supraorbital.

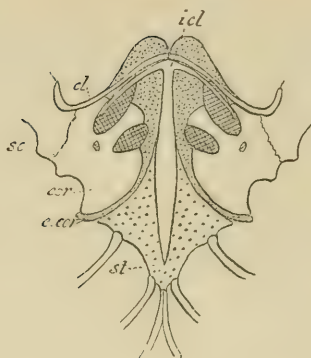
st. Supratemporal.

sq. Squamosal.

tp. Transpalatine.

tu. Turbinal.

v. Vomer.

Fig. 22.—Pectoral arch of *Varanus griseus*.

cl. Clavicle.
st. Sternum.

cor. Coracoid.
e.cor. Epicoracoid.

icl. Interclavicle.
sc. Scapula.

Synopsis of the Species.

I. Ventral scales smooth.

- Nostril a little nearer end of snout than orbit. . . . *V. flavescens*, p. 76.
Nostril much nearer orbit than end of snout *V. nebulosus*, p. 77.

II. Ventral scales keeled.

- Nostril much nearer orbit than end of snout;
nuchal scales large, not or but slightly keeled . . . *V. dumerilii*, p. 77.
Nostril much nearer orbit than end of snout;
nuchal scales extremely large, strongly keeled . . . *V. rudicollis*, p. 78.
Nostril much nearer end of snout than orbit;
nuchal scales small, not larger than dorsals . . . *V. salvator*, p. 78.

75. *Varanus flavescens*.

Monitor flavescens, Gray, Griff. A. K. ix, Syn. p. 25 (1831).

Varanus flavescens, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 634 (1847); Günth. Rept. Brit. Ind. p. 65, pl. ix, fig. A (1864); Bouleng. Cat. Liz. ii, p. 309 (1885); id. Faun. Brit. Ind., Rept. p. 164 (1890).

Teeth subconical, scarcely compressed, Snout short, convex, a little less than half length of head to ear. Nostril elongate, oblique, a little nearer end of snout than orbit. Median series of supraocular scales slightly enlarged transversely. Scales on upper surfaces moderate, oval, keeled. Ventral scales smooth. Tail compressed, keeled above. Olive or yellowish brown above, with irregular darker markings which are generally confluent into broad cross-bars; a blackish temporal streak; lower parts yellowish, with rather indistinct brown cross-bars, most distinct on the throat. Young dark brown above, with yellow spots confluent into cross-bars; yellow beneath, with dark brown cross-bars.

From snout to vent 410 millim.; tail 510.

Nepal, Bengal, Burma, and in the Malay Peninsula at Trang and Penang.

Terrestrial.

76. *Varanus nebulosus*.

Monitor nebulosus, Gray, Griff. A. K. ix, Syn. p. 27 (1831).

Varanus nebulosus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 633 (1847); Günth. Rept. Brit. Ind. p. 66, pl. ix, fig. D (1864); Bouleng. Cat. Liz. ii, p. 311 (1885); id. Faun. Brit. Ind., Rept. p. 165 (1890); id. Fascic. Malay., Zool. i, p. 157 (1903).

Teeth acute, compressed. Snout pointed, convex, about half length of head. Nostril elongate, oblique, nearly twice as distant from end of snout as from orbit. 4 or 5 transversely enlarged supraocular scales. Scales on upper surfaces small, oval, obtusely keeled, those on anterior part of neck larger, subcircular, not keeled. Ventral scales smooth. Tail compressed, keeled above. Greenish or brownish olive above, irregularly marbled and dotted with darker and lighter; chin and throat with transverse blackish bands, or marbled with blackish. Young with numerous yellowish ocelli above, and the lower parts marbled with blackish; nape with two posteriorly-directed, chevron-shaped blackish bands, the anterior proceeding from the eyes.

From snout to vent 350 millim.; tail 600.

Bengal, Burma, Siam, Malay Peninsula (Jalor, Perak, Malacca, Singapore, Penang).

Found on river-banks.

77. *Varanus dumerilii*.

Monitor dumerilii (S. Müll.) Schleg. Abbild. p. 78 (1844).

Varanus macrolepis, Blanf. Journ. Asiat. Soc. Bengal, i, p. 239, pl. xvi (1881).

Varanus dumerilii, Bouleng. Cat. Liz. ii, p. 312 (1885); id. Faun. Brit. Ind., Rept. p. 165 (1890).

Teeth acute, compressed. Snout depressed at the end, a little more than half length of head to ear. Nostril oval, oblique, nearly twice as distant from end of snout as from orbit. Middle supraocular scales slightly enlarged transversely. Scales on upper surface of neck very large, about as long as broad, flat, the hindermost slightly keeled; dorsal scales large, oval, keeled. Ventral scales slightly keeled. Tail compressed, with a very low, doubly-toothed crest. Light brown above; a dark temporal streak, from eye to ear, usually confluent with a U-shaped dark marking on the neck; back with very broad dark transverse bars, broader than the interspaces between them; limbs dark brown, spotted with yellow; more or less distinct vertical dark bars on the lips; belly yellowish, uniform or with transverse dark bands. Young with the head and neck yellow with black markings, and the body and

tail black with yellow transverse bands; these yellow parts, Mr. Robinson informs me, are vermilion in life.

From snout to vent 370 millim.

Known from Tenasserim, Borneo, Sumatra, and the Malay Peninsula, whence only young specimens have as yet been obtained.

78. *Varanus rudicollis*.

Gray, Cat. Liz. p. 10 (1845); Bouleng. Cat. Liz. ii, p. 313 (1885);
id. op. cit. iii, p. 505 (1887); Laidlaw, P. Z. S. 1901, i, p. 310.

Teeth acute, compressed. Snout pointed, more than half length of head. Nostril oblique, more than twice as distant from end of snout as from orbit. Supraocular region with a posterior central series of 3 to 6 transversely dilated scales. Scales on upper surface of neck extremely large and prominent, strongly keeled, forming 10 to 12 longitudinal series; dorsal scales small, strongly keeled. Ventral scales keeled. Tail compressed, with a low, doubly-toothed crest. Blackish above, neck and anterior part of body yellowish, the former with three black longitudinal streaks, the latter with two broad transverse black bands; hinder part of back and flanks with yellowish ocelli; limbs with small yellowish spots; lower parts with black reticulations.

From snout to vent 440 millim.

Malay Peninsula, Trang, Perak (forests at foot of Gunong Inas), Selangor and Malacca; Borneo, Philippines. Found in heavy jungle.

79. *Varanus salvator*.

Stellio salvator, Laur. Syn. Rept. p. 56 (1768).

Varanus salvator, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 635 (1847); Bouleng. Cat. Liz. ii, p. 314 (1885); id. Faun. Brit. Ind., Rept. p. 166 (1890); S. Flower, P. Z. S. 1896, p. 873; Ridley, Journ. Straits Br. Asiat. Soc., No. 32, p. 190 (1899); Bouleng. Fasc. Malay., Zool. i, p. 187 (1903).

Hydrosaurus salvator, Günth. Rept. Brit. Ind. p. 67, pl. ix, fig. E (1864).

Teeth acute, compressed. Snout depressed at the end, about half length of head. Nostril oval, at least twice as far from orbit as from end of snout. Supraocular region with a series of 4 to 8 transversely enlarged scales. Scales on upper surfaces small, oval, keeled. Ventral scales keeled. Tail strongly compressed, keeled above. Dark brown or blackish above, with yellow spots or ocelli; snout usually lighter, with transverse black bars, most distinct on the lips, and continued across the chin; a black temporal band, commencing from the eye and bordered by a yellow band which sometimes extends along the side of the neck; lower parts yellow. The markings most accentuated in the young.

From snout to vent 1040 millim.; tail 1320.

Ceylon, Nepal and Southern China to the Malay Peninsula and Archipelago.

Found in marshy localities or on trees overhanging rivers: enter the water readily. Lays its eggs in burrows or in hollow tree-trunks. By far the commonest of the Malay Varanidæ.

Family LACERTIDÆ.

Skull with bony postorbital and postfronto-squamosal arches, with bony dermal plates roofing over the supratemporal fossæ; præmaxillary single; nasals distinct; parietal single; a fibro-cartilaginous interorbital septum; a columella cranii. Dentition pleurodont; palate often toothed. Clavicle dilated and perforated proximally; interclavicle cruciform.

Tongue flat, elongate, bifid in front, covered with rhomboidal scale-like imbricate papillæ or oblique plicæ converging forwards. Pupil round; eyelids well developed. Head covered with large symmetrical shields. Ventral scales large, shield-like, forming longitudinal and transverse series, distinguished from the lateral scales. Limbs well developed. Femoral or inguinal pores usually present. Tail long, fragile.

The family of true Lizards, mostly small, terrestrial creatures, laying eggs with parchment-like shell or bringing forth their young alive, is spread all over Europe, Asia, and Africa, but in the Malay region it is only represented by one species of the aberrant genus *Tachydromus*.

Genus TACHYDROMUS.

Daudin, Hist. Rept. iii, p. 251 (1802).

Head-shields normal. Nostril pierced between two nasals and the first labial. A more or less distinct collar. Back covered with large, rhomboidal, keeled shields forming longitudinal series; flanks granular; ventral shields rhomboidal, imbricate, all or part keeled. Digits subcylindrical, with smooth, tubercular lamellæ below. Inguinal pores. Tail extremely long, cylindrical.

Eastern Asia. Only one species in the Malay Peninsula.

80. *Tachydromus sexlineatus*.

Daud. t. c. p. 256, pl. xxxix; Günth. Rept. Brit. Ind. p. 69, pl. viii, fig. C (1864); Bouleng. Cat. Liz. iii, p. 4 (1887); id. Faun. Brit. Ind., Rept. p. 169 (1890); Laidlaw, P. Z. S. 1901, i, p. 310.

Supraoculars in contact with the supraciliaries; the large anterior supraocular in contact with the loreal; temporal scales strongly keeled. 6 or 8 longitudinal series of strongly keeled shields on the nape, 4 on the back, median pair largest; 10 or 12

longitudinal series of strongly keeled ventral shields. 1 or 2 inguinal pores on each side. Greenish or brownish above, with metallic gloss; a more or less distinct whitish, black-edged streak from the supraciliary edge along each side of the back to the base of the tail; the black band bordering the light streak produced along the side of the head; sides frequently with small round light spots; lower parts yellowish or greenish.

From snout to vent 60 millim.; tail 285.

From Southern China and the Eastern Himalayas to the Malay Peninsula and Archipelago. Fairly common in the more northern parts of the Peninsula as far south as Taiping, where it is called "Benkarong Ular," or Snake-lizard. According to Annandale, it runs about on the top of the long grass; apparently the great length of its body, produced chiefly by the remarkable extent of the tail, saves it from breaking the grass or falling through to the ground. When chased, it seeks safety by diving, so to speak, down through the grass to the ground.

Family SCINCIDÆ.

Skull with bony postorbital and postfronto-squamosal arches, with bony dermal plates roofing over the supratemporal fossæ; præmaxillaries distinct; nasals distinct; parietal single; a fibro-cartilaginous interorbital septum; a columella cranii. Dentition pleurodont; palate often toothed. Clavicle dilated, usually perforated proximally; interclavicle cruciform.

Tongue flat, moderately elongate, nicked in front, covered with rhomboidal scale-like imbricate papillæ. Pupil round; eyelids usually well developed. Head covered with large symmetrical shields. Body protected by bony plates underlying the scales, which are cycloid or cyclo-hexagonal, imbricate, arranged quincuncially above and beneath. Limbs more or less developed or absent. No femoral pores. Tail usually long, fragile.

The family of Scinks includes terrestrial and arboreal forms, inhabiting all the warmer parts of the world. They are as a rule ovoviparous, but some of the species of *Mabuia* lay soft-shelled eggs.

Only two genera have representatives in the Malay Peninsula:—

Pterygoid bones separated in the middle line of the palate, the palatal notch extending anteriorly to an imaginary line connecting centres of eyes; dorsal scales usually with several keels in the Malayan species *MABUIA*, p. 82.

Pterygoid bones in contact in front, the palatal notch not extending to between centres of eyes; dorsal scales usually smooth in the Malayan species *LYGOSOMA*, p. 85.

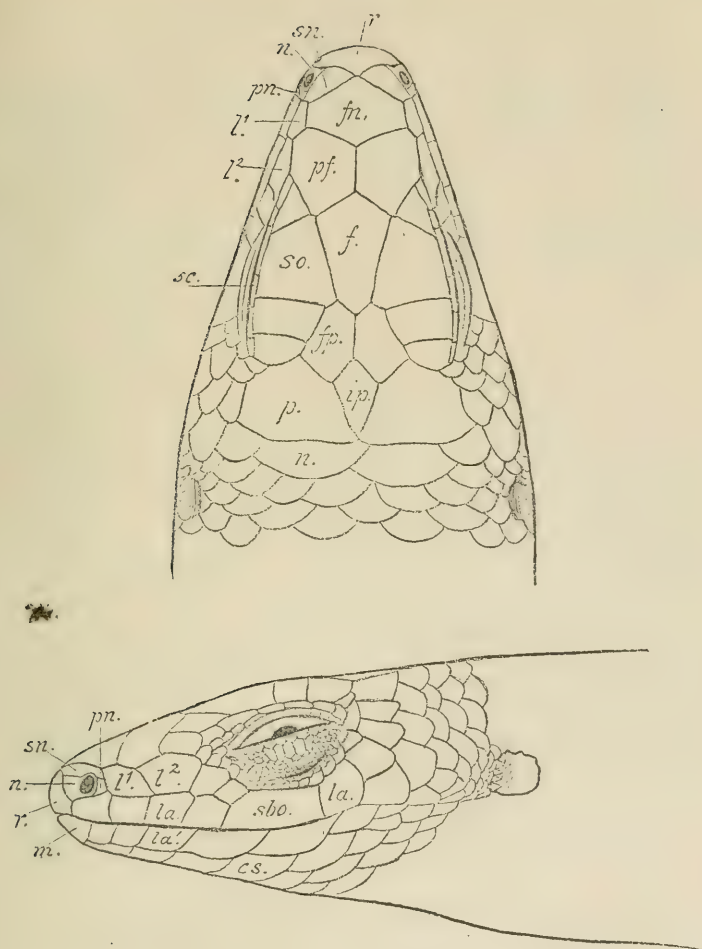


Fig. 23.—Upper and side views of head of *Mabua multifasciata*, to explain the nomenclature of the shields.

cs. Chin-shields.
f. Frontal.
fn. Frontonasal.
fp. Frontoparietal.
ip. Interparietal.
l. Loreals.
la. Upper labials.

la'. Lower labials.
m. Mental.
n. Nasal.
n'. Nuchal.
p. Parietal.
pf. Præfrontal.

pn. Postnasal.
r. Rostral.
sbo. Subocular.
sc. Supraciliaries.
sn. Supranasal.
so. Supraocular.

Genus **MABUIA**.

Fitzinger, N. Class. Rept. p. 23 (1826).

Palatine bones in contact mesially; palatal notch separating entirely the pterygoids. Movable eyelids; ear distinct, tympanum more or less deeply sunk. Nostril in a single nasal; supranasals, præfrontals, and frontoparietals present. Limbs well developed, pentadactyle; digits subcylindrical or compressed, with transverse lamellæ beneath.

India, Africa and Madagascar, Southern Asia, Central and South America, and West Indies.

Malay name, *Bengkarong*.

Synopsis of the Species.

I. Dorsal scales with 5 to 11 strong keels.

32 scales round the body, dorsals with 9 to 11 keels (3 median strong); 2 or 3 lobules in front of the ear *M. novemcarinata*, p. 82.

26 to 30 scales round the body, dorsals with 5 to 7 keels; ear nearly as large as a lateral scale, with or without very indistinct lobules anteriorly; anterior loreal deeper than second, *M. macularia*, p. 83.

26 scales round the body, dorsals with 5 keels; ear very small, with projecting granules all round; anterior loreal not deeper than second, *M. rugifera*, p. 83.

II. Dorsal scales without or with 2 or 3 (rarely 5) keels.

30 to 34 (usually 32) scales round the body, dorsals with 3 (rarely 5) keels; ear with 3 to 5 short lobules, *M. multifasciata*, p. 84.

26 to 30 (usually 28) scales round the body, dorsals smooth or with 2 or 3 keels; ear without lobules, *M. siamensis*, p. 84.

81. *Mabuia novemcarinata*.

Euprepes novemcarinatus, Anders. Journ. Asiat. Soc. Bengal, xl, p. 12 (1871).

Mabuia novemcarinata, Bouleng. Cat. Liz. iii, p. 179 (1887); S. Flower, P. Z. S. 1896, p. 873.

No postnasal; anterior loreal not deeper than second; supranasals in contact behind the rostral; frontonasal in contact with the frontal; four supraoculars, six supraciliaries; interparietal entirely separating the parietals; 4 labials anterior to the subocular. Ear-opening roundish or oval, nearly as large as a lateral scale, with 2 or 3 small lobules anteriorly. 32 scales round the body, dorsals with 9 to 11 keels. The hind limb reaches the wrist of the adpressed fore limb. Olive-brown above, with blackish

spots; a broad blackish lateral band, from the tip of the snout, passing through the eye and above the ear, to the base of the tail; whitish beneath (pale green in life).

From snout to vent 98 millim.; tail 110.

Originally described from Mandalay, Burma, this species has been rediscovered by Capt. Flower on Penang Hill, at an altitude of 2200 ft.

82. *Mabuia macularia*.

Euprepes macularius, Blyth, Journ. Asiat. Soc. Bengal, xxii, p. 652 (1853).

Euprepes brevis, Günth. P. Z. S. 1875, p. 225.

Mabuia macularia, Bouleng. Cat. Liz. iii, p. 182 (1887); id. Faun. Brit. Ind., Rept. p. 190 (1890); id. Fascic. Malay., Zool. i, p. 158 (1903).

Mabuia brevis, Bouleng. Cat. t. c. p. 183, pl. xi, fig. 1 (1887).

Postnasal usually absent; anterior loreal deeper and shorter than second; frontonasal in contact with the rostral and usually with the frontal; four supraoculars, five supraciliaries; interparietal entirely separating the parietals; 4 (exceptionally 3) labials anterior to the subocular. Ear-opening oval, as large as or a little larger or a little smaller than a lateral scale, with or without a few very indistinct lobules anteriorly. 26 to 30 scales round the body, dorsals with 5 to 7 sharp keels. Scales on tibia mostly bicarinate. The adpressed limbs meet or overlap. Brown or olive-brown above, sides darker and usually with white black-edged spots; back uniform or black-spotted, or with one or two black longitudinal lines; sometimes two light lateral lines on each side, well marked only on the neck; lower parts yellowish.

From snout to vent 65 millim.; tail 85.

India, Burma, Indo-China, Siam. Rare in the Malay Peninsula (Biserat, Jalor).

83. *Mabuia rugifera*.

Tiliqua rugifera, Stoliczka, Journ. Asiat. Soc. Bengal, xxxix, p. 170, pl. x, fig. 3 (1870).

Mabuia rugifera, Bouleng. Cat. Liz. iii, p. 184 (1887); id. Faun. Brit. Ind., Rept. p. 190 (1890); S. Flower, P. Z. S. 1899, p. 645; Annandale, Journ. Asiat. Soc. Bengal (2) i, p. 141 (1905).

Postnasal usually absent; anterior loreal not deeper and much smaller than second; frontonasal largely in contact with the rostral, and nearly always with the frontal; four supraoculars, 6 (rarely 5) supraciliaries; interparietal entirely separating the parietals; 4 or 5 labials anterior to the subocular. Ear-opening very small, oval, with projecting granules round its border. 26 scales round the body, dorsals with 5 very strong keels. Scales on tibia bicarinate. The hind limb reaches the elbow of the adpressed fore limb. Dark olive brown above, usually with 5 or 7

continuous or interrupted light longitudinal lines, greenish-white beneath (orange-red in life).

From snout to vent 65 millim.; tail 120.

Nicobars, Malay Peninsula (Perak, Selangor, Singapore), Sumatra, Borneo, Java.

84. *Mabuia multifasciata*.

Scincus multifasciatus, Kuhl, Beitr. z. Zool. u. vergl. Anat. p. 126 (1820).

Euprepes rufescens, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 652 (1847); Günth. Rept. Brit. Ind. p. 79 (part.) (1864).

Mabuia multifasciata, Bouleng. Cat. Liz. iii, p. 186 (1887); id. Faun. Brit. Ind., Rept. p. 191; S. Flower, P. Z. S. 1899, p. 645; Annandale, Journ. Asiat. Soc. Bengal (2) i, p. 141 (1905).

A postnasal; anterior loreal not deeper than the second; supranasals frequently in contact behind the rostral, or narrowly separated; præfrontals forming a median suture; four supraoculars, five or six supraciliaries; interparietal entirely separating the parietals; 4 (rarely 3) labials anterior to the subocular. Ear-opening roundish or oval, as large as or a little smaller than a lateral scale, usually with a few very small lobules anteriorly. 30 to 34 (usually 32) scales round the body, dorsals tricarinate (rarely quinquecarinate). Scales on tibia mostly tricarinate. The hind limb reaches the wrist or the elbow of the adpressed fore limb. Colour very variable. Brown or olive above, uniform or with a dark brown lateral band, or with dark spots, or with a light dorso-lateral band, or with a red lateral band or blotch; sides frequently dark brown with light, black-edged ocelli. Bright sulphur or pale greenish below, throat sometimes whitish or bluish white.

From snout to vent 130 millim.; tail 220.

Common from Burma and Siam to the Malay Peninsula and Archipelago and New Guinea. Called "Sun Lizard" or "Grass Lizard" in the Straits Settlements. Capt. Flower observes that numbers are to be seen when the sun comes out after heavy rain, sunning themselves in the grass and on stones and showing off their brilliant metallic colours. By far the commonest Scink in the Peninsula.

85. *Mabuia siamensis*.

Eumeces siamensis, Günth. Rept. Brit. Ind. p. 91 (1864).

Mabuia siamensis, Bouleng. Cat. Liz. iii, p. 188 (1887); S. Flower, P. Z. S. 1899, p. 647; Bouleng. Fascic. Malay., Zool. i, p. 158 (1903); id. Journ. Fed. Mal. St. Mus. iii, p. 67 (1908).

A postnasal; anterior loreal not deeper than second; supranasals frequently in contact behind the rostral; præfrontals often forming a median suture; four supraoculars, 6 (rarely 5 or 7) supraciliaries; interparietal entirely separating the parietals; 4 labials

anterior to the subocular. Ear-opening roundish or oval, as large as or a little larger than a lateral scale, without projecting lobules. 26 to 30 (usually 28) scales round the body, dorsals smooth or more or less distinctly bi- or tricarinate. The hind limb reaches the elbow of the adpressed fore limb. Bronze-brown above, the back usually immaculate, but sometimes with five more or less distinct narrow longitudinal black lines; a broad dark brown or black band on each side, bordered with pale yellow above; sides below the lateral band pale sulphur or greenish yellow; lower parts emerald green, or yellowish green.

From snout to vent 116 millim.; tail 214.

Formosa, Hainan, Siam, Malay Peninsula (Jalor and Pahang).

M. tyleri (Boulenger, Cat. p. 187; Annandale, Journ. Asiat. Soc. Bengal (2) i, 1905, p. 142), from the Andamans, should perhaps be united with *M. siamensis*.

Genus **LYGOSOMA**.

Gray, Zool. Journ. iii, p. 228 (1827).

Palatine bones in contact mesially; pterygoid bones also in contact anteriorly, the palatal notch not extending forwards to between the centres of the eyes. Movable eyelids; ear distinct or hidden. Nostril in a single nasal; supranasals present or absent; præfrontals and frontoparietals present (the latter sometimes fused). Limbs well developed, rudimentary, or absent.

Represented in every part of the world, Europe excepted.

Malay name, *Bengkaronj*.

Synopsis of the Species.

I. Limbs well developed, pentadactyle.

A. Ear-opening distinct.

1. Lower eyelid scaly; no supranasals.

a. The limbs overlap when pressed against the body.

α. 24 to 28 scales round the body.

24 scales round the body; 22 to 25 lamellæ under the fourth toe *L. stellatum*, p. 87.

28 scales round the body; 20 lamellæ under the fourth toe *L. præsigne*, p. 88.

β. 30 to 34 scales round the body.

30 or 32 scales round the body; no nuchals; 23 or 24 lamellæ under the fourth toe *L. scotophilum*, p. 88.

32 or 34 scales round the body; 3 or 4 pairs of nuchals; 22 or 23 lamellæ under the fourth toe *L. sanctum*, p. 89.

γ. 38 to 42 scales round the body; 16 to 21 lamellæ under the fourth toe.

5 supraoculars; the hind limb does not reach beyond the shoulder *L. maculatum*, p. 89.

- 4 supraoculars; the hind limb reaches nearly the eye *L. anomalopus*, p. 90.
- b.* The limbs do not meet when pressed against the body; 32 scales round the body; 12 to 15 lamellæ under the fourth toe.
- Fourth toe considerably longer than third .. *L. malayanum*, p. 91.
- Fourth toe not or but slightly longer than third *L. butleri*, p. 91.
2. Lower eyelid scaly; supranasals present.
- a.* The limbs overlap when pressed against the body; 28 to 30 scales round the body, dorsals with 5 to 9 keels; 17 to 20 lamellæ under the fourth toe.. *L. olivaceum*, p. 91.
- b.* The limbs do not meet when pressed against the body.
- a.* 26 to 30 scales round the body; frontal not broader than supraocular region; 12 to 15 lamellæ under the fourth toe.
- The labial below the eye (subocular) much longer than deep, usually about twice as long as the shield preceding it *L. bowringii*, p. 92.
- The labial or labials below the eye not longer than deep, not twice as long as the other labials *L. albopunctatum*, p. 93.
- β.* 38 or 40 scales round the body; frontal broader than supraocular region; 16 lamellæ under the fourth toe. *L. bampfyldei*, p. 93.
2. Lower eyelid with an undivided transparent disk.
- a.* No supranasal; 28 scales round the body; 25 lamellæ under the fourth toe *L. vittigerum*, p. 94.
- b.* Supranasals present; fronto-parietal single; 35 to 38 lamellæ under the fourth toe.
- 36 to 40 scales round the body *L. atrocostatum*, p. 94.
- 34 scales round the body *L. singaporense*, p. 95.
- B. Ear covered with scales; no supranasal.
- a.* Frontoparietal single; 18 or 20 scales round the body; lower eyelid with an undivided semi-transparent disk.
- Distance between end of snout and fore limb $1\frac{1}{2}$ times in distance between axilla and groin *L. quadrivittatum*, p. 95.

Distance between end of snout and fore limb twice in distance between axilla and groin. *L. surdum*, p. 96.

b. Frontoparietal paired; 22 scales round the body; lower eyelid scaly *L. cophias*, p. 96.

II. Limbs rudimentary.

Digits five, extremely short, subequal; a punctiform ear-opening; 24 or 26 scales round the body *L. chalcides*, p. 97.

Digits two; ear hidden; 26 scales round the body *L. larutense*, p. 97.

Digits two to the fore limb; hind limb undivided; ear hidden; 22 scales round the body *L. miodactylum*, p. 98.

NOTE.—The *L. indicum*, Gray (Ann. & Mag. Nat. Hist. [2] xii, 1853, p. 388), ranging from the Eastern Himalayas and Southern



Fig. 24.—*Lygosoma indicum*.

China to Tenasserim, and which is here figured, will probably be found in the Malay Peninsula. It differs from *L. maculatum* in having only four large supraoculars.

86. *Lygosoma stellatum*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 192 (1900).

Distance between end of snout and fore limb $1\frac{1}{4}$ to $1\frac{1}{3}$ times in distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb reaches the wrist or the elbow of the adpressed fore limb. Snout obtusely pointed; lower eyelid scaly; no supranasal; rostral forming a straight suture with the fronto-nasal; præfrontals meeting or forming a short median suture (in one specimen separated by a small azygous shield); frontal as long as frontoparietals and interparietal together; five supraoculars, fifth very small; parietals forming a suture behind the interparietal; 2 or 3 pairs of nuchals; fifth labial below centre of eye. Ear-opening oval, a little smaller than eye-opening; no auricular lobules. 24 smooth scales round the body, dorsals

largest, those of the two median series more than twice as broad as long. A pair of enlarged præanals. Digits rather long, compressed; subdigital lamellæ smooth, 22 to 25 under the fourth toe. Bronze-colour above, spotted all over with black and white, the black spots preceding the white ones and more crowded on the sides; lips spotted with black; the spots disposed in transverse series on the tail; lower parts bluish or greenish white.

From snout to vent 80 millim.; tail 93.

Larut Hills, Perak, between 3500 and 4000 ft. altitude.

87. *Lygosoma præsigne*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 191 (1900); id. Fasc. Malay., Zool. i, p. 159 (1903); id. Journ. Fed. Mal. St. Mus. iii, p. 67 (1908).

Distance between end of snout and fore limb $1\frac{1}{3}$ to $1\frac{1}{2}$ times in distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb reaches the elbow of the adpressed fore limb. Snout obtusely pointed; lower eyelid scaly; no supranasal; rostral forming a straight suture with the frontonasal; præfrontals usually forming a median suture; frontal very narrow behind, at least as long as frontoparietals and interparietal together; 5 supraoculars, fifth very small; parietals forming a very short suture behind the interparietal; 3 pairs of nuchals; fifth labial below centre of eye. Ear-opening oval, nearly as large as eye-opening; no auricular lobules. 28 smooth scales round the body, dorsals largest, those of the two median series more than twice as broad as long. A pair of enlarged præanals. Digits rather long, compressed; subdigital lamellæ smooth, 20 under the fourth toe. Reddish brown above, marbled with darker or with scattered black dots, grey on the sides, spotted with black and white; a series of large roundish black spots on each side of the neck and anterior part of body; lips spotted with black; tail black above and on the sides, with irregular annuli of whitish scales or brown with blackish cross-bars; lower parts white.

From snout to vent 110 millim.; tail (reproduced) 130.

Fairly common on all the high hills of the Peninsula.

88. *Lygosoma scotophilum*.

Bouleng. Journ. Bombay Nat. Hist. Soc. xiii, p. 335 (1900).

Lygosoma floweri, Laidlaw, P. Z. S. 1901, i, p. 310.

Distance between end of snout and fore limb not much less than that between axilla and groin. Limbs well developed, slender, pentadactyle; the hind limb reaches the elbow, the axilla, or the shoulder. Snout obtusely pointed; lower eyelid scaly; no supranasal; rostral forming a straight suture with the frontonasal; præfrontals just meeting in the middle or narrowly

separated; frontal very narrow behind, as long as frontoparietals and interparietal together; five supraoculars; parietals forming a short suture behind the interparietal; no nuchals; fifth and sixth labials below the eye. Ear-opening oval, smaller than the eye-opening; no auricular lobules. 30 or 32 smooth scales round the body, dorsals largest. A pair of feebly enlarged præanals. Digits slender; subdigital lamellæ smooth, 22 or 23 under the fourth toe. Brown above, with yellowish and dark brown spots; the latter may form a lateral band, spotted with yellowish, and a wavy vertebral band; lips white, spotted with dark brown; lower parts white.

From snout to vent 50 millim.; tail 80.

The type specimen was caught by Mr. A. L. Butler under a limestone rock in the Batu Caves, Selangor. The types of *L. floweri* are from the foot of Gunung Inas, Perak. Specimens have also been found near Kuala Lumpur, and at Ulu Gombak, Selangor, and on Pulau Rumpia, Sembilan Islands.

89. *Lygosoma sanctum*.

Dum. & Bibr. *Erp. Gén.* v, p. 732 (1839); M. Weber, *Zool. Ergebn.* ii, p. 171, pl. xiv, fig. 4 (1890).

Distance between end of snout and fore limb $1\frac{1}{5}$ times in distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb reaches the axilla. Snout obtuse; lower eyelid scaly; no supranasal; rostral forming a broad suture with the frontonasal, which forms a narrow suture with the frontal; latter as long as frontoparietals and interparietal together; five supraoculars; parietals forming a suture behind the interparietal; no nuchals; fifth and sixth labials below the eye. Ear-opening oval, rather large, but smaller than the eye-opening; no auricular lobules. 32 or 34 scales round the body, dorsals largest and finely striated, laterals smallest. A pair of large præanals. Digits long, compressed; subdigital lamellæ feebly uncarinate, 25 or 26 under the fourth toe. A silvery vertebral band, bordered on each side by a black band spotted with whitish; sides greyish brown; lower parts whitish.

From snout to vent 48 millim.; tail 68.

Originally described from Java. A specimen from Selangor, 1500 ft., is preserved in the Raffles Museum.

90. *Lygosoma maculatum*.

Lissonota maculata, Blyth, *Journ. Asiat. Soc. Bengal*, xxii, p. 653 (1853).

Mabuia maculata, Günth. *Rept. Brit. Ind.* p. 84 (1864).

Lygosoma maculatum, Bouleng. *Cat. Liz.* iii, p. 242 (1887); id. *Faun. Brit. Ind.*, *Rept.* p. 196 (1890).

Lygosoma mitanense, Annandale, Journ. Asiat. Soc. Bengal (2) i, p. 144 (1905).

Distance between end of snout and fore limb $1\frac{1}{5}$ to $1\frac{1}{2}$ times in distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb reaches the elbow, the axilla, or the shoulder. Snout obtuse; lower eyelid scaly; no supranasal; rostral perfectly flat or a little concave above, forming a broad suture with the frontonasal, which forms a narrow suture with the frontal; latter as long as frontoparietals and interparietal together; five supraoculars; parietals forming a suture behind the interparietal; nuchals absent, or one or two pairs; fifth and sixth labials below the eye. Ear-opening oval, rather large but smaller than the eye-opening; no auricular lobules. 38 to 42 smooth scales round the body, dorsals largest, laterals smallest. A pair of large præanals. Digits long, compressed; subdigital lamellæ feebly uncarinate, 16 to 21 under the fourth toe. Brown or olive-brown above, usually with two dorsal series of small dark brown spots; a dark brown lateral band, usually spotted with whitish and edged below with white; flanks white-spotted; lower parts white.

From snout to vent 65 millim.; tail 115.

From the Eastern Himalayas and Northern Bengal to the Malay Peninsula (Larut Hills, Perak, 1000 ft.; also found at Kuala Lumpur and on the islands of the Pahang coast).

91. *Lygosoma anomalopus*.

Bouleng. P. Z. S. 1890, p. 84, pl. xi, fig. 4.

Lygosoma paradoxum, Werner, Verh. zool.-bot. Ges. Wien, xlvii, p. 13, pl. i, fig. 3 (1896).

Distance between end of snout and fore limb nearly equal to distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb nearly reaches the eye. Snout obtuse; lower eyelid scaly; no supranasal; rostral flat above, forming a broad suture with the frontonasal; præfrontals forming a short median suture; frontal very narrow behind, as long as frontoparietals and parietals together; four supraoculars; parietals in contact behind the interparietal; no nuchals; fifth and sixth or sixth and seventh labials below the eye. Ear-opening oval, large but smaller than the eye-opening; no auricular lobules. 38 smooth scales round the body, laterals smallest. A pair of large præanals. Fingers moderate, toes very unequal, the fourth half as long as the distance between axilla and groin, with 16 keeled subdigital lamellæ. Brown above, with pale reddish-brown transverse bands; a black loreal streak; a series of white spots along each side; lower parts white.

From snout to vent 70 millim.

Penang and Sumatra.

92. *Lygosoma malayanum*.

Doria, Ann. Mus. Civ. Genova (2) vi, p. 651 (1888); M. Weber, Zool. Ergebn. ii, p. 170 (1890).

Distance between end of snout and fore limb $1\frac{3}{5}$ times in distance between axilla and groin. Limbs well developed but short, pentadactyle, not meeting when pressed against the body. Snout obtuse; lower eyelid scaly; no supranasal; rostral forming a straight suture with the frontonasal; præfrontals forming a median suture or narrowly separated; frontal shorter than frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind the interparietal; no nuchals; fifth labial below centre of eye. Ear-opening oval, a little smaller than the eye-opening; no auricular lobules. 32 smooth scales round the body. A pair of enlarged præanals. Toes short, fourth considerably longer than third; subdigital lamellæ smooth, 13 to 15 under the fourth toe. Dark brown above, spotted or reticulated with yellowish or pale brown spotted with blackish; a dark lateral band, edged with yellowish above; lower parts yellowish.

From snout to vent 65 millim.; tail 85.

Sumatra. A specimen from Selangor is preserved in the Kuala Lumpur Museum, and two have recently been obtained on Gunong Grah, Upper Perak, 6900 feet, by Mr. J. N. Sheffield.

93. *Lygosoma butleri*, sp. n.

Distance between end of snout and fore limb $1\frac{3}{5}$ to $1\frac{2}{3}$ times in distance between axilla and groin. Limbs short, pentadactyle, not meeting when pressed against the body. Snout obtuse; lower eyelid scaly; no supranasal; rostral forming a straight suture with frontonasal; præfrontals forming a median suture; frontal shorter than frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind interparietal; no nuchals; fourth and fifth labials below eye. Ear-opening nearly as large as eye-opening; no auricular lobules. 30 or 32 smooth scales round the body. A pair of enlarged præanals. Toes short, third and fourth equal or fourth slightly longer; subdigital lamellæ smooth, 12 or 13 under the fourth toe. Dark brown above, spotted with yellowish; a dark lateral band, edged with yellowish, most distinct on the head and neck; lower parts yellowish.

From snout to vent 43 millim.

Described from five specimens, obtained by Mr. A. L. Butler in the Larut Hills, Perak, between 4000 and 4500 ft. altitude.

94. *Lygosoma olivaceum*.

Dasia olivacea, Gray, Ann. & Mag. Nat. Hist. ii, p. 331 (1838).

Euprepes ernestii, Dum. & Bibr. Exp. Gén. v, p. 696 (1839); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 653 (1847).

Euprepes olivaceus, Günth. Rept. Brit. Ind. p. 80, pl. x, fig. D (1864).

Lygosoma olivaceum, Bouleng. Cat. Liz. iii, p. 251 (1887); id. Faun. Brit. Ind., Rept. p. 198 (1890); S. Flower, P. Z. S. 1896, p. 874.

Distance between end of snout and fore limb $1\frac{1}{5}$ to $1\frac{1}{2}$ times in the distance between axilla and groin. Limbs well developed, pentadactyle; the limbs feebly overlap, the hind limb never reaching beyond the wrist. Snout obtusely acuminate; lower eyelid scaly; a supranasal, rarely in contact with its fellow; frontonasal usually in contact with the rostral and frequently also with the frontal; frontal as long as frontoparietals and interparietal together, or a little longer; four supraoculars; parietals not meeting behind the interparietal; fifth labial below the eye. Ear-opening very small. 28 or 30 scales round the body, dorsals with 3 to 9 more or less strong keels. Digits moderate, strongly compressed at the end; subdigital lamellæ smooth, 17 to 20 under the fourth toe. Olive or olive-brown above, with more or less regular transverse series of pale, dark-edged spots, or traces of dark cross-bands; a more or less distinct pale dorso-lateral band on the posterior part of the body, continued on the tail; lower parts light green. Young with the back and limbs black, the former with pale greenish or yellow narrow cross-bands; tail brilliant scarlet.

From snout to vent 110 millim.; tail 130.

Tenasserim, Nicobars, Malay Peninsula and Archipelago. Known from Penang, Province Wellesley, Selangor, Singapore, and the Sembilan Islands near the Dindings.

95. *Lygosoma bowringii*.

Eumeces bowringii, Günth. Rept. Brit. Ind. p. 91 (1864).

Euprepes punctatostratus, Peters, Mon. Berl. Ac. 1871, p. 31.

Lygosoma bowringii, Bouleng. Cat. Liz. iii, p. 308, pl. xxiii, fig. 3 (1887); id. P. Z. S. 1897, p. 214; S. Flower, P. Z. S. 1899, p. 650.

Lygosoma whiteheadi, Mocquard, Le Natural. 1890, p. 144.

Distance between end of snout and fore limb $1\frac{1}{2}$ to $2\frac{1}{5}$ times in distance between axilla and groin. Limbs well developed but short, pentadactyle, not meeting when pressed against the body. Snout obtuse; lower eyelid scaly; supranasals present, in contact behind the rostral; frontonasal forming a suture with the frontal, which is as long as frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind the interparietal; a pair of nuchals; fifth (rarely fourth) upper labial below the eye, much longer than deep, usually about twice as long as the shield preceding it. Ear-opening small, round. 26 to 30 scales round the body, smooth or dorsals indistinctly tricarinate. Marginal præanals a little enlarged. Digits moderate, compressed; fourth toe a little longer than third, with 12 to 14 feebly keeled lamellæ inferiorly. Yellowish brown or olive-brown

above, each dorsal scale with a darker spot forming more or less continuous longitudinal lines; a dark brown dorso-lateral band, edged with yellowish above; sides pale pink to bright vermilion, spotted with black and yellow; yellow beneath, sometimes pale coral-red on the throat.

From snout to vent 55 millim.; tail 65.

First described from Hong Kong, this species has since been recorded from Tonkin, Burma, Siam, the Malay Peninsula, Borneo, and Celebes. In the Malay Peninsula it is only known from Singapore and Jambu, one of the Patani States.

Capt. Flower observes that this Scink spends the day hiding under stones, logs, &c., and only goes about after its prey at twilight.

96. *Lygosoma albopunctatum*.

Riopa albopunctata, Gray, Ann. & Mag. Nat. Hist. xviii, p. 430 (1846).

Eumeces punctatus, Cantor, Journ. Asiatic Soc. Bengal, xvi, p. 651 (1847).

Eumeces albopunctatus, Günth. Rept. Brit. Ind. p. 92 (1864).

Lygosoma albopunctatum, Bouleng. Cat. Liz. iii, p. 309 (1887); id. Faun. Brit. Ind., Rept. p. 208 (1890).

Distance between end of snout and fore limb 2 to $2\frac{1}{3}$ times in distance between axilla and groin. Limbs well developed but short, pentadactyle, not meeting when pressed against the body. Snout obtuse; lower eyelid scaly; supranasals present, in contact behind the rostral; frontonasal forming a suture with the frontal, which is as long as frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind the interparietal; nuchals present or absent; fifth or fifth and sixth labials below centre of eye, not longer than deep, not twice as long as the other labials. Ear-opening small, round. 26 or 28 smooth scales round the body. Marginal præanals scarcely enlarged. Digits moderate, compressed; fourth toe a little longer than third, with 12 to 15 feebly keeled lamellæ inferiorly. Pale brown or rufous above, each dorsal scale with a darker spot forming longitudinal series; sides spotted with black and white; lower parts yellowish white.

From snout to vent 65 millim.; tail 75.

India, Assam, Burma, and Penang.

97. *Lygosoma bampfyldei*.

E. Bartlett, Journ. Straits Branch Asiatic Soc. No. 28, p. 96 (1895); Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 192 (1900).

Lygosoma schneideri, Werner, Zool. Jahrb., Syst. xiii, p. 487, pl. xxxi, fig. 1 (1900).

Distance between end of snout and fore limb $1\frac{3}{4}$ times in distance between axilla and groin. Limbs well developed but short, pentadactyle, not meeting when pressed against the body.

Snout obtuse; lower eyelid scaly; supranasals present, in contact behind the rostral; frontonasal forming a broad suture with the frontal; præfrontals small; frontal broader than supraocular region, slightly longer than frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind the interparietal; fourth or fourth and fifth labials below the eye. Ear-opening rather small, oval, with three pointed lobules in front. 38 or 40 smooth scales round the body. No enlarged præanals. Digits short, compressed; fourth toe a little longer than third, with 16 obtusely keeled lamellæ inferiorly. Pale brown above, head dark brown above, with a yellow band across the occipital region; sides of head yellow, with a dark brown spot below the eye; lower parts yellowish; tail olive.

From snout to vent 120 millim.

Borneo and Sumatra. Discovered in the Larut Hills, Perak, by Mr. A. L. Butler.

98. *Lygosoma vittigerum*.

Bouleng. Ann. Mus. Civ. Genova (2) xiv, p. 615 (1894); id. Journ. F. M. S. Mus. iii, p. 67 (1908).

Distance between end of snout and fore limb not much less than that between axilla and groin. Limbs well developed, slender, pentadactyle; the hind limb reaches nearly the axilla. Snout acutely pointed; lower eyelid with an undivided transparent disk; no supranasal; nostril forming a straight suture with the frontonasal; præfrontals just meeting or forming a median suture; frontal very narrow behind, as long as or a little shorter than frontoparietals and interparietal together; four supraoculars; parietals forming a suture behind the interparietal; 3 or 4 pairs of nuchals; fifth labial below the eye. Ear-opening small, roundish; no auricular lobules. 28 smooth scales round the body, those of the two vertebral series much larger than the others, laterals very small. A pair of enlarged præanals. Digits slender; subdigital lamellæ smooth, 25 under the fourth toe. A greenish-white vertebral stripe, extending to the end of the snout, bordered on each side by a rather broad black stripe; sides pale olive, with or without black dots; lower parts greenish white.

From snout to vent 40 millim.; tail 55.

Originally described from Sereinu, Mentawai Islands, this species has since been rediscovered in Sarawak and in the Malay Peninsula at Kuala Teku, Pahang, 500 ft., and also at Ginting Bidai, 2300 ft.

99. *Lygosoma atrocostatum*.

Scincus atrocostatus, Lesson, Voy. 'Coquille,' Zool. ii, p. 50, pl. iv, fig. 3 (1830).

Mabouya jerdoniana, Stoliczka, Journ. Asiat. Soc. Bengal, p. 172 (1870).

Lygosoma atrocostatum, Bouleng. Cat. Liz. iii, p. 295 (1882);
S. Flower, P. Z. S. 1899, p. 649.

Lygosoma jerdonianum, Bouleng. t. c. p. 300.

Distance between end of snout and fore limb $1\frac{1}{5}$ to $1\frac{1}{3}$ times in distance between axilla and groin. Limbs well developed, pentadactyle; the hind limb reaches the elbow or the axilla. Snout obtusely pointed; lower eyelid with an undivided transparent disk; supranasal present; frontonasal forming a suture with the rostral and often also with the frontal; latter smaller than the frontoparietal, which is single; four supraoculars; interparietal small, the parietals meeting behind it; a pair of nuchals; four or five labials anterior to the large subocular. Ear-opening oval, as large as or a little larger than the transparent palpebral disk, usually with one or two small projecting lobules anteriorly. 36 to 40 smooth scales round the body. Marginal præanals slightly enlarged. Digits moderately elongate, somewhat flattened except at the end; subdigital lamellæ smooth, 35 to 38 under the fourth toe. Greyish, brownish, or olive-green above, with small darker and lighter spots; a more or less distinct blackish lateral band or series of spots on each side; greenish, yellowish, or orange below.

From snout to vent 95 millim.; tail 170.

A widely distributed species, ranging from Borneo to New Guinea, the Caroline and Santa Cruz Islands, and Cape York. Occurs also on Pulau Tikus Kechil, a small island off the North-east Coast of Penang, whence it was first described as *Mabouya jerdoniana*.

100. *Lygosoma singaporense*.

Eumeces singaporensis, Steind. Sitzb. Ak. Wien, lxii, i, p. 341, pl. iv, fig. 2 (1870).

Lygosoma singaporense, Bouleng. Cat. Liz. iii, p. 297 (1887).

Only known from Steindachner's description. Apparently agrees with the preceding species, except in having only 34 scales round the body. Yellowish grey above; some of the scales on the flanks much lighter.

Singapore.

Annandale, Journ. Asiat. Soc. Bengal (2) i, p. 147, 1905, is probably right in uniting *L. singaporense* with *L. atrocostatum*. He records a specimen from Sinkep Island.

101. *Lygosoma quadrivittatum*.

Peters, Mon. Berl. Ac. 1867, p. 19; Boulenger, Cat. Liz. iii, p. 329 (1887); id. Fascic. Malay., Zool. i, p. 159 (1903).

Distance between end of snout and fore limb $1\frac{1}{2}$ times in distance between axilla and groin. Limbs well developed, pentadactyle, not meeting when pressed against the body. Snout pointed; lower eyelid with an undivided semitransparent disk;

no supranasal; frontonasal broadly in contact with rostral and with frontal; præfrontals small; frontal small, acutely pointed behind, scarcely longer than frontoparietal, which is single; four supraoculars; parietals forming a suture behind the interparietal; 3 or 4 pairs of nuchals; fifth upper labial below the eye. Ear hidden under scales, indicated by a mere depression. 18 or 20 smooth scales round the body, of two dorsal rows largest. Præ-anals slightly enlarged. Digits slender; fourth toe the longest, with 15 or 16 lamellæ inferiorly. Yellowish or pale brown above, with four blackish longitudinal bands, the median pair extending to the supraoculars, the lateral to the eyes; digits with dark cross-bars; lower parts yellowish or brownish white.

From snout to vent 37 millim.

Borneo, Philippines, Celebes, Malay Peninsula. Found on Bukit Besar, Patani States, by Messrs. Annandale & Robinson.

102. *Lygosoma surdum*.

Bouleng. Journ. Bombay Nat. Hist. Soc. xiii, p. 333, pl. —, fig. 2 (1900).

Distance between end of snout and fore limb nearly twice in distance between axilla and groin. Limbs well developed but short, pentadactyle, widely separated when pressed against the body. Snout pointed; lower eyelid with an undivided semi-transparent disk; no supranasal; frontonasal broadly in contact with rostral and with frontal; præfrontals small; frontal narrow, a little longer than frontoparietal, which is single; four supraoculars; parietals forming a suture behind the interparietal; three pairs of nuchals; fourth and fifth labials below the eye. Ear hidden under scales, indicated by a mere depression. 20 smooth scales round the body, of two dorsal rows largest. Præ-anals scarcely enlarged. Fourth toe longest, with 16 lamellæ inferiorly. Uniform dark brown above, greyish beneath.

From snout to vent 50 millim.; tail 67.

Known from two specimens discovered by Mr. A. L. Butler in Selangor: the first on the Sungei Buloh River, among the roots of a large epiphytic plant; the second at Kuala Lumpur, under the dead fibre round a palm tree.

103. *Lygosoma cophias*.

Bouleng. Journ. Fed. Mal. St. Mus. iii, p. 67, pl. iv, fig. 3 (1905).

Distance between end of snout and fore limb twice in distance between axilla and groin. Limbs well developed but short, widely separated when pressed against the body. Snout obtuse; lower eyelid scaly; no supranasal; frontonasal forming a broad suture with the rostral and a narrow one with the frontal, which is

scarcely longer than the interparietal; four supraoculars; parietals in contact behind the interparietal; no nuchals; fourth and fifth labials below the eye. Ear hidden, indicated by a depression. 22 smooth scales round the body. No enlarged præanals. Toes short, fourth not longer than third, with 12 smooth lamellæ inferiorly. Brown above, mottled with darker, white beneath.

From snout to vent 36 millim.

A single specimen was obtained on Gunong Tahan, at an altitude of 3000 feet.

104. *Lygosoma chalcides*.

Lacerta chalcides, Linn. Syst. Nat. i, p. 369 (1766).

Lygosoma chalcides, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 660 (1847); Bouleng. Cat. Liz. iii, p. 340 (1887); S. Flower, P. Z. S. 1899, p. 652.

Eumeces chalcides, Günth. Rept. Brit. Ind. p. 90 (1864).

Body much elongate; limbs very weak, pentadactyle. Snout obtuse; lower eyelid scaly; no supranasal; frontonasal forming a suture with the rostral and with the frontal; præfrontals small; frontal small, a little broader than the supraocular region; four supraoculars; frontoparietal single, large; parietals forming a suture behind the interparietal; fifth labial below eye, first largest. Ear-opening punctiform, about as large as nostril. 24 or 26 smooth scales round the body. Præanals not or very slightly enlarged. Digits extremely short, subequal. Pale brown above, with more or less distinct darker longitudinal lines running between the series of scales, or with fine longitudinal golden-brown lines; white beneath, uniform or with brown longitudinal lines.

From snout to vent 96 millim.; tail 96.

Southern China, Siam, Malay Peninsula, Java. Known from Penang, Perak, and Kelantan.

Dr. Annandale observes that the limbs of this species are of more use in progression than their small size would indicate. These lizards are, however, burrowing forms, so often associated with the Typhlopidae that the Malays regard them as the larvæ of these snakes.

105. *Lygosoma larutense*.

Bouleng. Ann. Mag. Nat. Hist. (7) v, p. 306 (1900).

Body much elongate; limbs minute, didactyle. Snout obtuse; lower eyelid scaly; no supranasal; frontonasal broadly in contact with rostral and with frontal; præfrontals small; frontal slightly longer than broad, broader than the supraocular region; four supraoculars; parietals forming a suture behind the interparietal; fourth labial below the eye. Ear completely hidden. 26 smooth

scales round the body. A pair of enlarged præanals. Hind limb twice as long as fore limb; fingers tubercle-like, clawed, equal; second toe twice as long as first. Uniform brownish.

From snout to vent 114 millim.; tail 128.

The type of this species was obtained by Mr. Wray on Maxwell's Hill, Perak, at an altitude of 3000 ft. Other specimens were obtained by Mr. Butler in the same locality at 4000 ft.

106. *Lygosoma miodactylum*.

Bouleng. Fascic. Malay., Zool. i, p. 159, pl. x, fig. 3 (1903).

Body much elongate; limbs minute, the anterior with two rudimentary, bud-like digits with blunt claws, the posterior terminating in a single sharp claw. Snout obtuse; lower eyelid scaly; no supranasal; frontonasal broadly in contact with the rostral and with the frontal; præfrontals small; frontal slightly longer than broad, broader than the supraocular region; four supraoculars; parietals forming a suture behind the interparietal; fourth labial below the eye. Ear completely hidden. 22 smooth scales round the body. A pair of enlarged præanals. Dark brown above, white beneath, sides white with longitudinal series of brown spots corresponding to the scales.

From snout to vent 87 millim.

A single specimen was found at the Semangko Pass, Selangor-Pahang Boundary, at an altitude of 2700 ft., and still remains unique.

Family DIBAMIDÆ.

Skull compact; no arches; præmaxillaries distinct; no inter-orbital septum; no columella cranii. Teeth small, pointed, hooked, none on the palate. Not even rudiments of the shoulder-girdle.

Tongue short, pointed in front, covered with curved lamellæ or plicæ. Eyes rudimentary, concealed under the shields. No ear-opening. Head with large shields. Body vermiform, covered with cycloid imbricate scales. Fore limbs absent; the hind pair absent or represented by a pair of flaps on the sides of the vent.

Degraded, burrowing lizards, in all probability derived from the *Scincidae*.

A single genus.



Fig. 25.—Upper and side views of head of *Dibamus novæ-guinææ*.

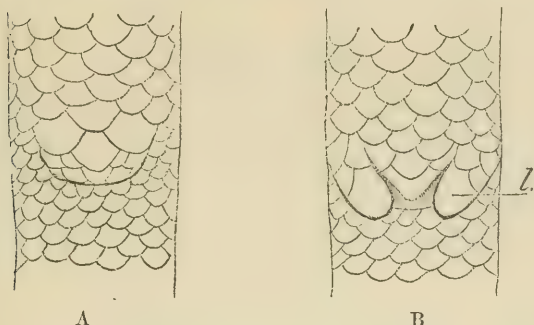


Fig. 26.—Anal region of *Dibamus novæ-guinææ*. A, Female. B, Male.
l. Rudimentary limbs.

Genus **DIBAMUS**.

Dum. & Bibr. *Erp. Gén.* v, p. 833 (1839).

Snout normally covered by three large shields, viz. the rostral, and a labial on each side, which, however, may fuse into a single shield; a frontal, an interparietal, and an ocular. Nostril pierced in the rostral, with a straight horizontal suture behind it. Limbs totally absent in the female, represented in the male by flap-like rudiments.

A single species.

107. *Dibamus novæ-guinææ*.

Dum. & Bibr. *t. c.* p. 834; Bouleng. *Cat. Liz.* iii, p. 435 (1887);
id. *Faun. Brit. Ind.*, Rept. p. 230 (1890); id. *Fascic. Malay.*,
Zool. i, p. 160 (1903).

Snout conical, obtuse, slightly projecting; interparietal larger than frontal, both broader than long; eye scarcely distinguishable

through the ocular; a narrow, elongate, trapezoid symphysial; a very large lower labial on each side. Scales equal, smooth, 22 to 26 round the body. Præanal scales very small. Tail very short, obtuse. Uniform purplish brown.

Total length 165 millim.; tail 18.

The distribution of this species extends from the Nicobars and the Malay Peninsula to New Guinea. In the Malay Peninsula it is only known from Bukit Besar, where an egg, containing a fully developed embryo, was obtained by Messrs. Annandale & Robinson. This egg, which was found by a native in a dead tree-trunk, was broad in proportion to its length, but not circular; it had a brittle and highly calcareous shell.

Suborder *OPHIDIA*.

Snakes. Limbless, without movable eyelids or ear-opening, with long, slender forked tongue retractile into a basal sheath, and with the rami of the lower jaw connected by ligament at the symphysis.

Seven families are represented in the Malay Peninsula. Poisonous Snakes are restricted to the fifth and seventh families.

Synopsis of the Families.

- I. Eyes covered over by shields; body worm-like, covered with uniform imbricate scales; tail rudimentary; only the upper jaw toothed **Typhlopidae**, p. 101.
- II. Eyes exposed; median row of ventral scales more or less enlarged, usually forming transverse shields; both jaws toothed.
 - A. Maxillary bone horizontal.
 - i. Vestiges of hind limbs, terminating in a claw-like spur usually distinguishable on each side of the vent.
 - Tail prehensile; scales very small **Boidae**, p. 105.
 - Tail not prehensile, extremely short, blunt.... **Ilysiidae**, p. 109.
 - 2. No vestiges of hind limbs.
 - a. A mental groove.
 - Frontal shield in contact with a large azygous occipital; teeth in præmaxillary bone..... **Xenopeltidae**, p. 112.
 - No azygous occipital shield; no præmaxillary teeth **Colubridae**, p. 114.
 - b. No mental groove; maxillary bone converging posteriorly towards palatine..... **Amblycephalidae**, [p. 206.
 - B. Maxillary bone very short, vertically erectile **Viperidae**, p. 211.

Family TYPHLOPIDÆ.

Cranial bones solidly united; no transpalatine; pterygoids not extending to mandible; no supratemporal; maxillary vertical, loosely attached, with a few teeth; lower jaw toothless; coronoid bone present. Vestiges of pelvis, reduced to a single bone on each side. Body covered with uniform cycloid scales; eyes under the shields.

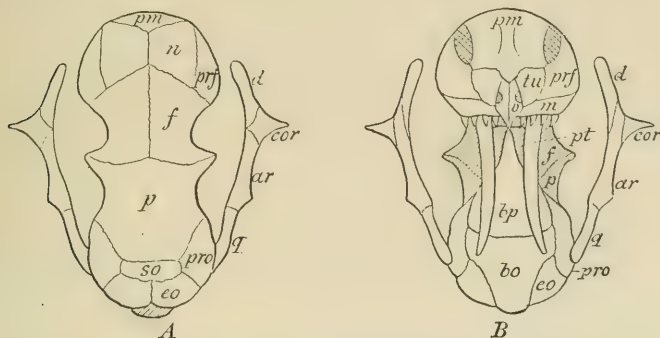


Fig. 27.—Skull of *Typhlops diardi*.

A. Upper view. B. Lower view.

- | | | |
|--------------------|-------------------|------------------|
| ar. Articular. | f. Frontal. | pro. Prootic. |
| bo. Basioccipital. | m. Maxillary. | pt. Pterygoid. |
| bp. Basisphenoid. | n. Nasal. | q. Quadrate. |
| cor. Coronoid. | p. Parietal. | so. Supraocular. |
| d. Dentary. | pm. Præmaxillary. | tu. Turbinal. |
| eo. Exoccipital. | prf. Præfrontal. | v. Vomer. |

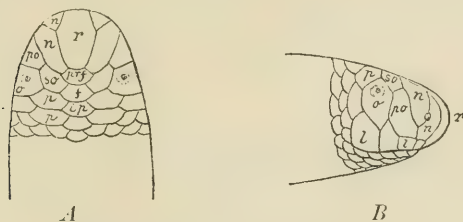


Fig. 28.—Head of *Typhlops braminus*.

A. Upper view. B. Side view.

To illustrate the nomenclature of the shields.

- | | | |
|--------------------|----------------|------------------|
| f. Frontal. | o. Ocular. | prf. Præfrontal. |
| ip. Interparietal. | p. Parietal. | r. Rostral. |
| l. Labial. | po. Præocular. | so. Supraocular. |
| n. Nasal. | | |

Small worm-like Snakes leading a subterranean life, feeding principally on worms. Found in rotten trees, in the sawdust of saw-mills, and in the ground. Oviparous; eggs very large, elongate, few in number.

A single genus in the Malay Peninsula.

Genus **TYPHLOPS.**

Schneid. Hist. Amph. ii, p. 339 (1801).

Head with large shields; nostril in a single or divided nasal. Tail extremely short.

Southern Asia, borders of the Mediterranean, Africa, Australia, Central and South America and West Indies.

Six species are recorded from the Malay Peninsula, where they are known as *ular tana*, "earth-snakes."

Synopsis of the Species.

- I. No præocular; ocular in contact with the second and third labials; 22 scales round body *T. lineatus*, p. 102.
- II. A præocular, in contact with the second and third labials.
 - A. 18 or 20 scales round body.
Both nasals completely separated and extending to upper surface of head; 20 scales round body *T. braminus*, p. 103.
 - The two nasals fused above the nostril; 18 scales round body *T. albiceps*, p. 103.
 - B. 24 or 26 scales round body.
A rounded concavity on each side below the nostril [p. 104. *T. bothriorhynchus*,
No concavity below the nostril *T. nigroalbus*, p. 104.
- III. A præocular, separated from the labials by a small shield; 24 scales round body *T. mutilatus*, p. 105.

108. **Typhlops lineatus.**

Boie, Isis, 1827, p. 563; Bouleng. Cat. Sn. i, p. 15 (1893).

Pilidion lineatum, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 897 (1847).

Typhlina lineata Günth. Rept. Brit. Ind. p. 171, pl. xvi, fig. B (1864).

Snout rounded, strongly projecting, flat inferiorly; nostrils inferior. Rostral very large; nasal semidivided, the cleft proceeding from the first labial; a single large shield (the ocular) on each side behind the nasal; eyes hidden; præfrontal, supra-oculars, and frontals large, transverse; 4 upper labials. Diameter of body 40 to 60 times in total length; tail about as long

as broad, ending in a spine. 22 scales round the body. Blackish above, each scale with a yellowish spot, or yellowish or pale brownish with dark brown longitudinal lines running between the series of scales; head and lower parts yellowish white.

Total length 480 millim.

Malay Peninsula, where it is generally distributed, and the Archipelago.

109. *Typhlops braminus*.

Eryx braminus, Daud. Hist. Rept. vii, p. 279 (1803).

Typhlops braminus, Cuv. R. An. 2nd ed. ii, p. 73 (1829); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 899 (1847); Günth. Rept. Brit. Ind. p. 175, pl. xvi, fig. 1 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 236 (1890); id. Cat. Sn. i, p. 16 (1893).

Snout rounded, moderately projecting; nostrils lateral. Rostral narrow, its upper portion hardly one third the width of the head, not extending quite to the level of the eyes; nostril between two nasals, the anterior (lower) of which extends to the upper surface of the head and is in contact inferiorly with the præocular; præocular nearly as large as the ocular, in contact with the second and third labials; eyes distinct; upper head-scales a little larger than the scales on the body; 4 upper labials. Diameter of body 35 to 55 times in total length; tail as long as or a little longer than broad, ending in a spine. 20 scales round the body. Brown or blackish above, lighter beneath; snout, anal region, and end of tail usually whitish.

Total length 175 millim.

Widely distributed over Southern Asia and the islands of the Indian Ocean; also found in South Africa and in Mexico.

The commonest *Typhlops* in the Malay Peninsula.

110. *Typhlops albiceps*.

Bouleng. Ann. Mag. Nat. Hist. (7) i, p. 124 (1898); S. Flower, P. Z. S. 1899, p. 654, pl. xxxvii, fig. 1.

Snout rounded, moderately projecting; nostrils lateral. Rostral two fifths the width of the head, extending to between the eyes; nasal incompletely divided, the cleft extending from the second labial to a little beyond the nostril; præocular as broad as the nasal or the ocular; eyes just distinguishable; præfrontal, frontal, and interparietal moderately large, equal, slightly larger than the supraocular, in contact with the second and third labials; 4 upper labials. Diameter of body 64 times in total length; tail as long as broad, ending in a spine. 18 scales round the body. Pale or dark brown; head, anal region, and end of tail whitish.

Total length 128 millim.

Originally described from Siam. Has since been found in the Larut Hills, Perak.

111. *Typhlops bothriorhynchus*.

Günth. Rept. Brit. Ind. p. 174, pl. xvi, fig. G (1864); Bouleng. Faun. Brit. Ind., Rept. p. 239 (1890); id. Cat. Sn. i, p. 23 (1893).

Snout rounded and strongly projecting; nostrils lateral; a rounded concavity on each side below the nostril, and two others, less marked, on the third labial and on each side of the rostral. Rostral narrow, its upper portion about one third the width of the head, extending to between the eyes; nasal nearly completely divided, the cleft proceeding from the second labial and passing through the subnarial pit; a præocular, nearly as large as the ocular; eyes distinct; upper head-scales a little longer than the scales on the body; 4 upper labials. Diameter of body 30 times in total length; tail about as long as broad, ending in a spine. 24 scales round the body. Dark brown above, paler beneath.

Total length 160 millim.

The type of this species is said to be from Penang (Cantor's collection), but the species, which is known from the North-West Provinces of India and Assam, has not been rediscovered in the Malay Peninsula.

112. *Typhlops nigroalbus*.

Dum. & Bibr. Erp. Gén. vi, p. 205 (1844); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 898 (1847); Günth. Rept. Brit. Ind. p. 172, pl. xvi, fig. F (1864); Bouleng. Cat. Sn. i, p. 24 (1893); Laidlaw, P. Z. S. 1901, ii, p. 575.

Snout rounded and strongly projecting; nostrils lateral. Rostral narrow, its upper portion about one third the width of the head,

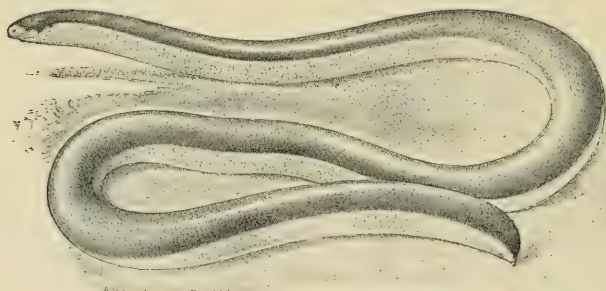


Fig. 29.—*Typhlops nigroalbus*.

extending to between the eyes or not quite so far; nasal nearly completely divided, the cleft proceeding from the second labial; a præocular, a little broader than the ocular, in contact with the second and third labials; eyes distinct; upper head-scales considerably larger than the scales on the body; 4 upper labials.

Diameter of body 30 to 33 times in total length; tail broader than long, ending in a spine. 26 scales round the body. Upper half black, lower yellowish white.

Total length 360 millim.

Malay Peninsula (Penang, Prov. Wellesley, Jalor [Bukit Besar], Kelantan, Perak, Singapore) and Sumatra.

113. *Typhlops mutilatus*.

Werner, Zool. Anz. xxiii, p. 196, fig. (1900).

Snout rounded and strongly projecting; nostrils lateral. Rostral narrow, its upper portion about one third the width of the head, not extending to between the eyes; nasal completely divided, the cleft proceeding from the first labial; a præocular, separated from the labials by a small shield; eyes distinct, separated from each other by a broad frontal and, on each side, by a small supra-ocular; 4 upper labials. Diameter of body 53 to 59 times in total length; tail blunt, without spine. 24 scales round the body. Brown, each scale with a darker dot; head and end of tail yellowish white.

Total length 296 millim.

The types, stated to be from Malacca, are preserved in the Berlin Museum.

Family BOIDÆ.

Maxillary, palatine, and pterygoid movable; transpalatine present; pterygoid extending to quadrate or mandible; supra-temporal present, attached scale-like to cranium, suspending quadrate; both jaws toothed; lower jaw with coronoid bone. Vestiges of pelvis and hind limbs, usually terminating in a claw-like spur visible on each side of the vent.

Inhabit all the warmer parts of the world.

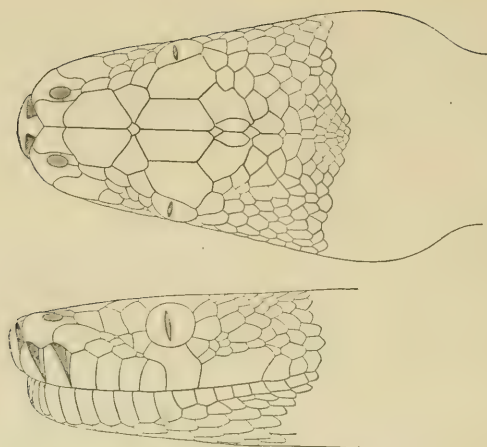
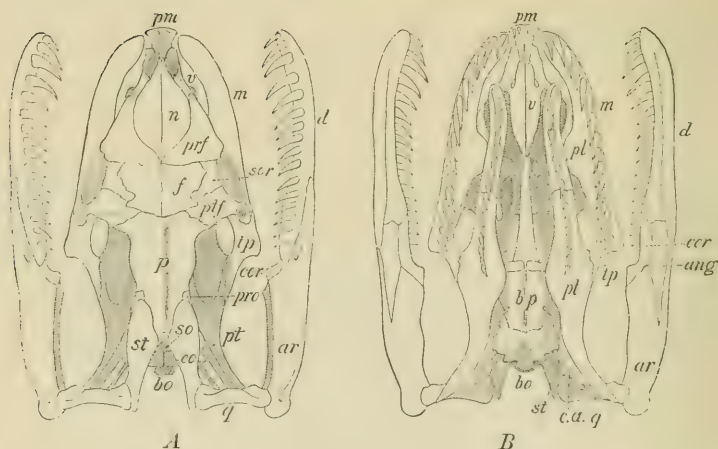
Only one genus occurs in the Malay Peninsula.

Genus PYTHON.

Daud. Hist. Rept. v, p. 226 (1803).

Præmaxillary bone toothed; anterior maxillary and mandibular teeth very long, gradually decreasing in size. Head distinct from neck; snout covered with shields; nostril supero-lateral; rostral and anterior upper labials with deep pits; some of the lower labials also pitted. Eye moderate, with vertical pupil. Scales small, smooth; ventral shields narrow. Tail moderate or short, prehensile; subcaudals all or greater part in two rows.

Africa, South-Eastern Asia, Papuasias, Australia.

Fig. 30.—Head of *Python molurus*.Fig. 31.—Skull of *Python reticulatus*.

A. Upper view. B. Lower view.

- | | | |
|------------------------------|--------------------------|----------------------------|
| <i>ang.</i> Angular. | <i>f.</i> Frontal. | <i>pt.</i> Pterygoid. |
| <i>ar.</i> Articular. | <i>m.</i> Maxillary. | <i>ptf.</i> Postfrontal. |
| <i>bo.</i> Basisphenoid. | <i>n.</i> Nasal. | <i>q.</i> Quadrate. |
| <i>bp.</i> Basisphenoid. | <i>p.</i> Parietal. | <i>so.</i> Supraoccipital. |
| <i>c.a.</i> Columella auris. | <i>pl.</i> Palatine. | <i>sor.</i> Supraorbital. |
| <i>cor.</i> Coronoid. | <i>pm.</i> Præmaxillary. | <i>st.</i> Supratemporal. |
| <i>d.</i> Dentary. | <i>prf.</i> Prefrontal. | <i>tp.</i> Transpalatine. |
| <i>ce.</i> Exoccipital. | <i>pro.</i> Prootic. | <i>v.</i> Vomer. |

Three species are known from the Malay Peninsula :—

- | | |
|---|---------------------------------|
| Rostral as deep as broad; 4 upper labials pitted; 69 to 79 scales across thickest part of body; ventrals 297–330; subcaudals 78–102 pairs | <i>P. reticulatus</i> , p. 107. |
| Rostral broader than deep; 2 upper labials pitted; 61 to 75 scales round body; ventrals 242–265; subcaudals 60–72 | <i>P. molurus</i> , p. 108. |
| Rostral broader than deep; 2 upper labials pitted; 53 to 57 scales round body; ventrals 160–175; subcaudals 26–32 | <i>P. curtus</i> , p. 109. |

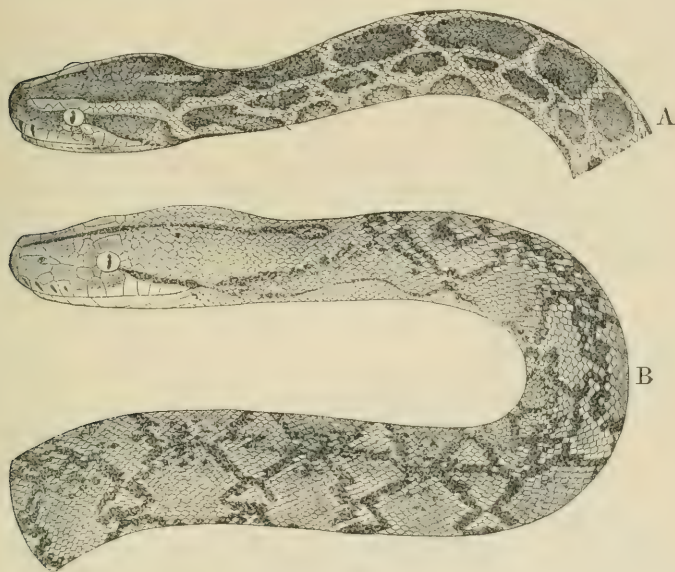


Fig. 32.—Head and anterior part of body of *Python molurus* (A) and *P. reticulatus* (B). (After Sordelli.)

114. *Python reticulatus*.

Boa reticulata, Schneid. Hist. Amph. ii, p. 264 (1801).
Python reticulatus, Gray, Zool. Misc. p. 44 (1842); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 902 (1847); Günth. Rept. Brit. Ind. p. 330 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 246 (1890); id. Cat. Sn. i, p. 85 (1893); S. Flower, P.Z.S. 1899, p. 654; Ridley, Journ. Straits Branch Roy. Asiat. Soc. 1899, p. 196; Kloss, op. cit. 1906, p. 281.

Malay name, *Ular sawah*.

Rostral as broad as deep; internasals about once and a half as long as broad, followed by a pair of large præfrontals; a large supraocular (rarely divided) and a large, usually undivided frontal;

12 to 14 upper labials, 4 anterior deeply pitted, seventh or eighth entering the eye; 2 or 3 of the anterior and 5 or 6 of the posterior lower labials pitted. Scales in 69 to 79 rows. Ventrals 297-330; anal entire; subcaudals 78-102. Light yellowish or brown above, with large circular, rhomboidal, or X-shaped bluish-black markings; young with three longitudinal series of light, black-edged spots; a black line along the middle of the head, from the end of the snout to the nape, and another on each side from behind the eye to the angle of the mouth; lower parts yellowish, with small brown spots on the sides, or nearly entirely brown.

Mr. Ridley mentions having seen a very dark, almost black variety.

Grows to a length of 30 feet, or more.

Burma and Indo-China, Malay Peninsula and Archipelago.

Fairly numerous in suitable places in the Malay Peninsula, where it is often mis-named "Boa constrictor" by the European residents.

This snake is nocturnal and lives chiefly on trees near the water, which it readily enters, and feeds on mammals and birds which it kills by constriction like all members of this family. Lays large oval, soft-shelled eggs, which the female incubates by coiling herself round them.

115. *Python molurus*.

Coluber molurus, Linn. Syst. Nat. i, p. 387 (1766).

Python molurus, Gray, Zool. Misc. p. 44 (1842); Günth. Rept. Brit. Ind. p. 331 (1864); Stoliczka, Journ. Asiat. Soc. Bengal, xxxix, p. 205 (1870); Bouleng. Faun. Brit. Ind., Rept. p. 246 (1890); id. Cat. Sn. i, p. 88 (1893).

Rostral broader than deep; internasals not more than once and a half as long as broad, followed by a pair of large præfrontals; a large supraocular, separated from its fellow by a pair of frontals; 11 to 13 upper labials, 2 anterior deeply pitted, sixth or seventh entering the eye, if not separated by a series of suboculars; a few of the anterior and posterior lower labials feebly pitted. Scales in 61 to 75 rows. Ventrals 242-265; anal entire; subcaudals 60-72. Greyish brown or yellowish above, with a dorsal series of large elongate subquadrangular reddish-brown black-edged spots, and on each side one or two series of smaller spots with light centres; a dark lance-shaped marking on the head and nape; a lateral brown stripe passing through the eye, and a brown vertical bar below the eye; lower parts yellowish, sides brown-spotted.

Grows to 30 feet, but a much heavier snake than the preceding.

India and Ceylon, Southern China, Burma, Malay Peninsula, Java.

Appears to be rare in the Malay Peninsula; neither Mr. Robinson nor Mr. Ridley has ever come across a specimen; recorded from the Province Wellesley by Stoliczka. Possibly introduced.

J. Hagenbeck ('Spolia Zeylonica,' 1905, p. 197) remarks on the incubation of the eggs, lasting $2\frac{1}{2}$ months, in a Ceylonese specimen 28 feet long. The eggs may number up to 100.

116. *Python curtus*.

Schlegel, Dierentuin, Rept. p. 54, fig. (1872); Bouleng. P. Z. S. 1889, p. 432, pl. xlv; id. Cat. Sn. i, p. 89 (1893).

Rostral broader than deep; internasals as broad as long, separated from the frontal and supraoculars by two pairs of large præfrontals; frontal longitudinally divided, followed by several pairs of transverse parietal shields; a large supraocular; a series of suboculars may separate the eye from the labials; 10 or 11 upper labials, the first 2 deeply pitted; anterior and posterior lower labials feebly pitted. Scales in 53 to 57 rows. Ventrals 160-175; anal entire; subcaudals 26-32. Brown or brick-red above, with a dorsal series of round pale spots, which may be confluent into a stripe on the posterior part of the back; a black line along the middle of the head, followed by elongate whitish black-edged spots; sides of body with greyish black-edged spots or wavy bands; sides of head dark, with an oblique light streak from behind the eye to the angle of the mouth; lower parts whitish, uniform or spotted with brown.

Grows to 9 feet; a short and stout snake.

Malay Peninsula, Sumatra, Borneo. According to Ridley (Journ. Straits Branch Roy. Asiat. Soc. 1899, p. 197) this little Python is not rare in the Malay Peninsula; he says it is a quiet snake in captivity, and seems to feed chiefly on rats. Not uncommon in swampy country, and known as *Ular sawah darah*, "the Blood Python."

Family ILYSIIDÆ.

Cranial bones more or less solidly united; transpalatine present; pterygoid extending to quadrate; supratemporal very small and wedged in between the adjacent bones; quadrate very short; teeth in both jaws; lower jaw with coronoid bone. Vestiges of pelvis as in the Boidæ.

These snakes may be regarded as degraded Boidæ.

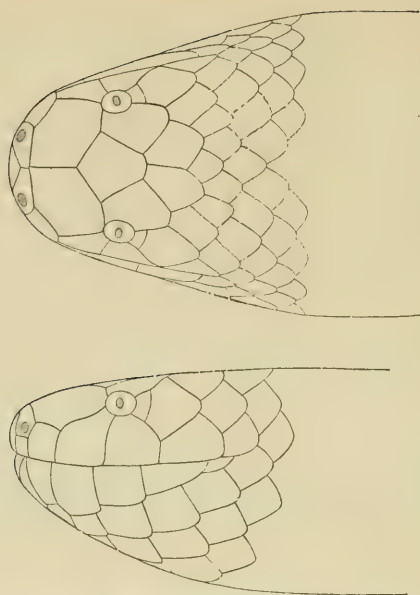
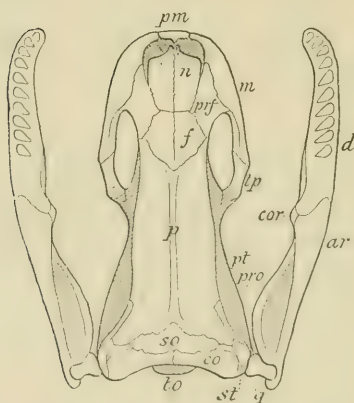
South-Eastern Asia and South America.

A single genus in the Malay Peninsula.

Genus *CYLINDROPHIS*.

Wagler, Icon. Amph. (1828).

Teeth moderate, 10 to 12 in each maxillary, none in præ-maxillary. Head small, not distinct from neck; eye very small, with round or vertically subelliptic pupil; head with large symmetrical shields; nostril in a single nasal, which forms a

Fig. 33.—Head of *Cyldindrophis rufus*.Fig. 34.—Skull of *Cyldindrophis rufus*.

ar. Articular.
bo. Basioccipital.
cor. Coronoid.
d. Dentary.
eo. Exoccipital.
f. Frontal.

m. Maxillary.
n. Nasal.
p. Parietal.
pm. Præmaxillary.
prf. Præfrontal.
pro. Prootic.

pt. Pterygoid.
q. Quadrate.
so. Supraoccipital.
st. Supratemporal.
tp. Transpalatine.

suture with its fellow behind the rostral; no loreal or præ-ocular; a small postocular; a mental groove. Body cylindrical; scales smooth, in 19 or 21 rows; ventrals feebly enlarged. Tail extremely short and blunt.

South-Eastern Asia.

Two species in the Malay Peninsula:—

- Diameter of eye 2 to 3 times in its distance from nostril and not more than twice in its distance from border of mouth..... *C. rufus*, p. 111.
 Diameter of eye about 4 times in its distance from nostril and more than twice in its distance from border of mouth *C. lineatus*, p. 111.

117. *Cylindrophis rufus*.

Anguis rufa, Laur. Syn. Rept. p. 71 (1768).

Cylindrophis rufus, Gray, Zool. Misc. p. 46 (1842); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 900 (1847); Günth. Rept. Brit. Ind. p. 179 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 250 (1890); id. Cat. Sn. i, p. 135 (1893); S. Flower, P. Z. S. 1899, p. 656, pl. xxxvii, fig. 3.

Diameter of eye 2 to 3 times in its distance from nostril, not more than twice in its distance from border of mouth; distance between eyes greater than length of snout; frontal at least as large as supraocular, a little larger than parietals; 6 upper labials, third and fourth entering the eye. Scales in 19 or 21 rows. Ventrals 186–245; anal divided; subcaudals 5–10. Irides black, with or without alternating whitish or pale brown cross-bands above, with transverse white or pale yellow bands beneath; an orange collar sometimes present; a bright vermilion mark on the tail often present.

Total length 825 millim.

Generally distributed from Burma and Siam to the Malay Peninsula. Called *Ular kepala dua* ("two-headed snake") by the Malays.

This burrowing snake has been observed by Capt. Flower to have the power of depressing its body. When touched or worried it will not attempt to strike or bite, but keeps its head flat on the ground and raises its tail off the ground in such a manner that any casual observer would imagine the tail was the head and think the snake to be threatening to strike.

The young are brought forth alive.

118. *Cylindrophis lineatus*.

Blanf. P. Z. S. 1881, p. 217, pl. xx; Bouleng. Cat. Sn. i, p. 137 (1893).

Diameter of eye about 4 times in its distance from nostril, more than twice in its distance from border of mouth; distance between eyes equal to length of snout; frontal about as large as the supra-ocular and a little larger than the parietal; 6 upper labials, third

and fourth entering the eye. Scales in 21 rows. Ventrals 210–215; anal divided; subcaudals 9–10. Blackish brown above, with two white longitudinal streaks; belly white, with alternating black cross-bands; head and tail yellowish.

Total length 730 millim.

First described from a single specimen from Singapore, this species has since been found in Borneo. This typical specimen was described from a collection sent by Dr. Dennys, who had been much in Borneo and did not label his specimens individually. It is therefore possibly not a Peninsular species.

Family XENOPELTIDÆ.

Cranial bones more or less solidly united; transpalatine present; pterygoid extending to quadrate; supratemporal present, suspending quadrate; præfrontal in contact with nasal; teeth in jaws, palate, and præmaxillary; lower jaw without coronoid bone.

A single genus.

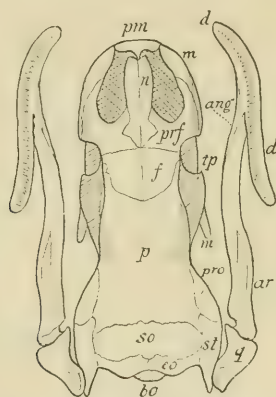


Fig. 35.—Upper view of skull of *Xenopeltis unicolor*.

ang. Angular.	m. Maxillary.	q. Quadrate.
ar. Articular.	n. Nasal.	so. Supraoccipital.
bo. Basioccipital.	p. Parietal.	st. Supratemporal.
d. Dentary.	pm. Præmaxillary.	tp. Transpalatine.
co. Exoccipital.	prf. Præfrontal.	
f. Frontal.	pro. Prootic.	

Genus XENOPELTIS.

Reinwardt, in Boie, Isis, 1827, p. 564.

Teeth small, equal, closely set, and very numerous (4 on each side of præmaxillary, 33–38 in each maxillary, 35–36 in each ramus of mandible). Dentary bone attached loosely to the apex of the articular and movable on it. Head not distinct from neck;

eye small, with vertically elliptic pupil. Nostril between two small nasals; frontal in contact with a large azygous interparietal or occipital shield, which is in the middle between four parietals. A mental groove. Body cylindrical; scales smooth, in 15 rows; ventrals large. Tail short; subcaudals in two rows.
 ‡ A single species.

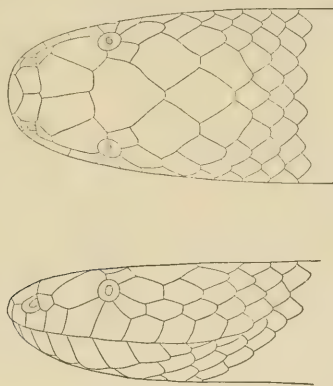


Fig. 36.—Head of *Xenopeltis unicolor*.

119. *Xenopeltis unicolor*.

Reinw. l. c.; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 901 (1847); Günth. Rept. Brit. Ind. p. 180 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 276 (1890); id. Cat. Sn. i, p. 168 (1893); S. Flower, P. Z. S. 1896, p. 878, and 1899, p. 657; Wall, Journ. Nat. Hist. Soc. Bombay, xix, p. 292, pl. x (1909).

Head much depressed, snout rounded; frontal as long as its distance from the rostral; supraocular small, smaller than the upper postocular; a single large præocular or loreal; 2 postoculars, upper the larger; 8 upper labials, first in contact with internasal, fourth and fifth entering the eye; a pair of very small chin-shields. Scales in 15 rows. Ventrals 166–196; anal divided; subcaudals 26–31. Black or brown above, highly iridescent, scales with lighter edges; upper lip and lower parts pale yellow; young with the head yellowish, with a broad yellow nuchal collar.

Total length 1000 millim.; tail 100.

Southern India, Burma, Indo-China, Siam, Malay Peninsula and Archipelago. Generally distributed throughout the Peninsula.

A burrowing snake, living mostly underground. Feeds on other snakes and small mammals.

Family COLUBRIDÆ.

Facial bones moveable; præfrontal not in contact with nasal; transpalatine present; pterygoid extending to mandible or quadrate; supratemporal present, usually attached scale-like to the skull and suspending quadrate; maxillary horizontal, not moveable perpendicularly to the transpalatine; both jaws toothed; lower jaw without coronoid bone.

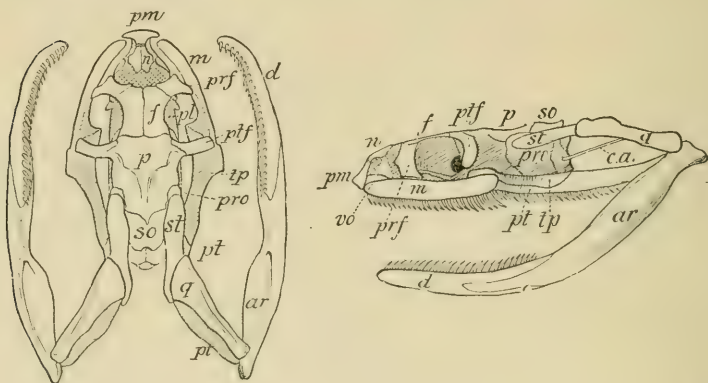


Fig. 37.—Skull of *Tropidonotus piscator*.

A. Upper view.

B. Side view.

ar. Articular.

c.a. Columella auris.

d. Dentary.

f. Frontal.

m. Maxillary.

n. Nasal.

p. Parietal.

pl. Palatine.

pm. Præmaxillary.

prf. Præfrontal.

pro. Prootic.

pt. Pterygoid.

ptf. Postfrontal.

q. Quadrate.

so. Supraoccipital.

st. Supratemporal.

tp. Transpalatine.

vo. Vomer.

Divided into three parallel series and six subfamilies:—

Series A. AGLYPHA.—All the teeth solid, not grooved. Harmless.

Subfam. *Acrochordineæ*.—Postfrontal bone produced over the supraorbital region; scales not imbricate. Thoroughly aquatic.

Subfam. *Colubrineæ*.—Postfrontal bone not produced over the supraorbital region; scales imbricate. Aquatic, terrestrial, or arboreal.

Series B. OPISTHOGLYPHA.—Only one or more of the posterior maxillary teeth grooved. More or less poisonous.

Subfam. *Homalopsineæ*.—Nostrils valvular, on upper surface of snout. Thoroughly aquatic.

Subfam. *Dipsadomorphineæ*.—Nostrils lateral. Terrestrial or arboreal.

Series C. PROTEROGLYPHA.—Anterior maxillary teeth grooved or ‘perforated’. Poisonous.

Subfam. *Hydrophiine*.—Tail strongly compressed. Marine.

Subfam. *Elapine*.—Tail cylindrical. Terrestrial.

Subfamily ACROCHORDINÆ.

Synopsis of the Genera.

I. No ventral shields.

Body scarcely compressed ACROCHORDUS, p. 115.

Body and tail compressed, with a fold below .. CHERSYDRUS, p. 116.

II. Ventral shields well developed XENODERMUS, p. 117.

Genus ACROCHORDUS.

Hornstedt, Abh. Ac. Stockh. viii, p. 307 (1787).

Teeth subequal, about 15 in each maxillary. Head not distinct from neck, covered with granular juxtaposed scales; nostrils close together on the top of the snout; eye very small, with vertically subelliptic pupil. Body stout, slightly compressed; scales very small, tubercular, spinose; no ventral shields. Tail short, sub-cylindrical, prehensile.

A single species.

120. *Acrochordus javanicus*.

Hornst. l. c. pl. xii; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 905 (1847); Günth. Rept. Brit. Ind. p. 336 (1864); Bouleng. Cat. Sn. i, p. 173 (1893); S. Flower, P. Z. S. 1899, p. 658.

Malay name, *Ular belalai gajah* (“elephant’s trunk snake”).

Head-scales very small, rough, larger and flat towards the mouth; no shields of any kind. About 120 to 150 scales round the body, dorsals largest. Brown or olive above, more or less distinctly spotted, striped, or marbled with black; lighter beneath.

Grows to 8 feet.

Siam, Malay Peninsula (Penang, Selangor, Pahang, Patani, Singapore), Borneo, Java, New Guinea.

A purely aquatic snake, frequenting ditches and canals. Hornstedt found a quantity of undigested fruits in the stomach of a specimen from Java. Cantor, who justly compares its physiognomy to that of a bull-dog, observed a female in his possession to bring forth 27 young ones, which showed themselves very active, and bit fiercely. Flower describes the adult as very powerful, twisting round one’s arm with a grasp like that of a python. In Siam it is valued for its skin, which is used for making the drum-heads of native drums, though that of the python is in greater request.

Genus **CHERSYDRUS**.

Cuvier, R. Anim. ii, p. 75 (1817).

Teeth subequal, 12 to 15 in each maxillary. Head not distinct from neck, small, covered with granular juxtaposed scales; nostrils close together on the top of the snout; eye very small, with vertically subelliptic pupil. Body stout, compressed; scales very small, juxtaposed, rhomboidal, with a short, tubercle-like keel, spinose on the belly; no ventral shields; a fold of the skin running along the median line of the abdomen. Tail short, compressed, prehensile.

A single species.

121. *Chersydrus granulatus*.

Hydrus granulatus, Schneid. Hist. Amph. i, p. 243 (1799).

Aerochordus granulatus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 906 (1847).

Chersydrus granulatus, Günth. Rept. Brit. Ind. p. 336 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 355, fig. (1890); id. Cat. Sn. i, p. 174 (1893); S. Flower, P. Z. S. 1899, p. 658.

No rostral shield, but a series of slightly enlarged shields on each lip, separated from the oral border by a series of minute



Fig. 38.—*Chersydrus granulatus*.

scales. About 100 scales round the body, dorsals largest. Dark olive or blackish, with pale cross-bands or annuli, which may become indistinct in the adult.

Total length 1000 millim.; tail 100.

Rivers and coasts from Southern India and Cochin China to New Guinea. Recorded from Penang, Singapore, and Patani.

Very similar in appearance to a *Hydrophis*, with which it is often confounded. Frequently found in the sea. Feeds on fish, and is viviparous.

Genus **XENODERMUS**

Reinhardt, Overs. Vid. Selsk. Forh. 1836, p. 6.

Teeth subequal, about 15 in each maxillary. Head distinct from neck, covered with granular juxtaposed scales; nostrils directed forwards, in an undivided nasal; eye moderate, with round pupil. Body slender, compressed, with small juxtaposed keeled scales and longitudinal rows of large tubercles; ventrals well developed. Tail long, with single subcaudals.

A single species.

122. *Xenodermus javanicus*.

Reinh. l. c., and Vid. Selsk. Skrift. x, p. 257, pl. ii, figs. 1-8 (1843)
Bouleng. Cat. Sn. i, p. 175 (1893).

Rostral small, triangular, not visible from above; nasals meeting behind the point of the rostral, followed by two pairs of small shields; labials scarcely enlarged, about 20 on each side. About 40 scales across the body; the enlarged tubercles disposed in pairs alternating with single ones on the vertebral line, and forming a single series along each side of the back. Ventrals 173-185; anal entire; subcaudals 147. Dark brown above, lighter beneath.

Total length 350 millim.; tail 135.

Java and Sumatra. Recorded from Penang by F. Müller, Verh. Nat. Ges. Basel, vii, 1887, p. 268. A specimen from the coast of Perak is preserved in the Federated Malay States Museum.

Nothing is known of the habits of this rare snake.

Subfamily COLUBRINÆ.

Synopsis of the Genera.

- | | |
|--|-------------------------|
| I. Teeth very small, equal, closely set, more than 35 in each maxillary; head not or but slightly distinct from neck; pupil round; scales smooth, in 17 rows | POLYDONTOPHIS, p. 120. |
| II. Less than 35 teeth in each maxillary. | |
| A. Pupil round; scales keeled, in 19 (rarely 17) rows; ventrals not angulate laterally, 120-180; subcaudals not more than 115. | |
| 1. A pair of internasal shields. | |
| Teeth equal nostril in a single nasal | XENOCHROPHIS, p. 121. |
| Teeth increasing in size posteriorly, forming a continuous series | TROPIDONOTUS, p. 122. |
| Two last teeth very large fangs, separated from the rest by an interspace | MACROPISTHODON, p. 128. |
| 2. A single internasal shield | HELICOPS, p. 130. |

B. Pupil vertically elliptic; scales smooth or feebly keeled; ventrals 178-265; subcaudals 50-110*.

Some of the anterior teeth enlarged, fang-like, separated from the rest by an interval space; scales in 17 or 19 rows

LYCODON, p. 131.

Maxillary teeth short, increasing in size posteriorly; scales in 13 or 15 rows

DRYOCALAMUS, p. 134.

C. Pupil round; head distinct from neck; scales smooth or feebly keeled (rarely strongly keeled); ventrals often keeled or angulate laterally, 160-285; subcaudals 50-165.

1. Scales in 14 or 16 rows ZAOCYS, p. 135.

* Unless otherwise stated in the generic diagnoses, the upper head-shields are understood to be normal, viz., to consist of a rostral, a pair of internasals, a pair of præfrontals, a frontal, a pair of parietals, and, on each side, a supraocular, one or two nasals, a loreal, one or more præ- and postoculars, temporals, and several labials.

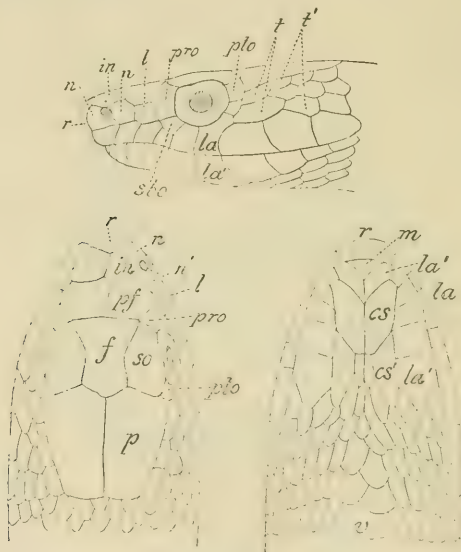


Fig. 39.—Three views of head of *Zamenis ventrimaculatus*, to explain the terminology of the head-shields.

- | | | |
|--------------------------------|------------------|-----------------------------|
| cs. Chin-shields (anterior). | m. Symphysial. | sbo. Subocular. |
| cs'. Chin-shields (posterior). | n. Nasal. | so. Supraocular. |
| f. Frontal. | p. Parietal. | t. Temporals (first row). |
| in. Internasal. | pf. Præfrontal. | t'. Temporals (second row). |
| l. Loreal. | pro. Præocular. | v. First ventral. |
| la. Upper labials. | pto. Postocular. | |
| la'. Lower labials. | r. Rostral. | |

2. Scales in odd numbers, forming straight longitudinal series.

a. Ventrals and subcaudals rounded or more or less distinctly angulate laterally.

Scales in 15 to 23 rows, vertebrals not enlarged; maxillary teeth increasing in size posteriorly

ZAMENIS, p. 136.

Scales in 17 rows, vertebrals slightly enlarged; maxillary teeth increasing in size posteriorly

XENELAPHIS, p. 139.

Scales in 19 to 27 rows; teeth equal.....

COLUBER, p. 139.

b. Ventrals and subcaudals with a suture-like lateral keel and a notch on each side, corresponding to the keel; scales in 19 rows

GONYOPHIS, p. 144.

3. Scales in 13 or 15 rows, oblique; ventrals and subcaudals with a suture-like lateral keel and a notch on each side corresponding to the keel.

Teeth increasing in size posteriorly; vertebral scales enlarged

DENDROPHIS, p. 145.

Teeth decreasing in size posteriorly; vertebral scales not or but slightly enlarged..

DENDRELAPHIS, p. 146.

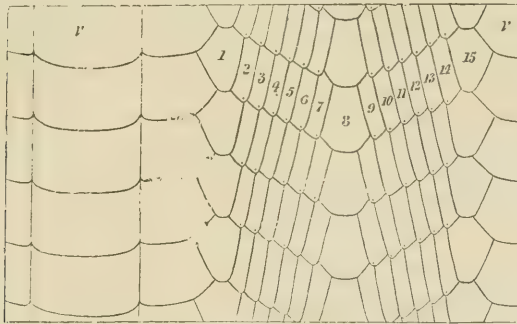


Fig. 40.—Scaling of body of *Dendrophis pictus*, showing the enlarged vertebral scales (8), the apical pit* on the oblique dorsal scales, and the lateral keel along the ventral shields (v).

* The apical pit is a minute impression near the extremity of the scale; these pits may be disposed in pairs. The character derived from the presence or absence of the apical pits appears to me of about the same systematic importance as the presence or absence of a keel on the dorsal scales, or the division or non-division of the subcaudal shields. In some cases it may aid in defining a natural genus, in others it breaks down as a generic character.

- D. Pupil round; head small, not or but slightly distinct from neck; scales smooth.
1. Nostril pierced in a moderately large, single or divided nasal; eye moderate.
Snout more or less projecting; rostral shield large; posterior maxillary teeth strongly enlarged; scales in 17 to 21 rows. SIMOTES, p. 147.
 - Snout not projecting; maxillary teeth equal; scales in 13 or 15 rows. ABLABES, p. 151.
 2. Nostril pierced between a nasal and the first labial; eye small; no internasals; scales in 15 rows. MACROCALAMUS, p. 153.
 3. Nostril pierced in a minute nasal; eye small; no temporals; parietals in contact with labials.
- Internasals present; scales in 15 rows PSEUDORHABDIUM, p. 154.
No internasals; scales in 13 rows CALAMARIA, p. 154.

Genus **POLYODONTOPHIS.**

Bouleng. Faun. Ind., Rept. p. 301 (1890).

Teeth very numerous and closely set, 35 to 50 in each maxillary, equal in size. Dentary bone completely detached from the articular posteriorly. Head small, not or but slightly distinct from neck; eye moderate or rather small, with round pupil. Body cylindrical, elongate; scales smooth, without apical pits, in (17 or 19) rows. Tail moderate or long; subcaudals in two rows.

South-Eastern Asia, Madagascar, and Comoro Islands; Central America.

Two species in the Malay Peninsula:—

- 9 upper labials, 3 entering the eye; ventrals 144–169; subcaudals 89–145 *P. geminatus*, p. 120.
7 or 8 upper labials, 2 entering the eye; ventrals 205–236; subcaudals 54–70. *P. sagittarius*, p. 121.

123. *Polyodontophis geminatus*.

Coluber geminatus, Boie, Isis, 1826, p. 211.

Ablabes melanocephalus, Günth. Rept. Brit. Ind. p. 229 (1864).

Polyodontophis geminatus, Bouleng. Cat. Sn. i, p. 185 (1893).

Rostral twice as broad as deep; suture between the internasals shorter than that between the præfrontals; frontal longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep or a little deeper than long; 1 præocular; 2 postoculars, both in contact with the parietal; temporals 2 + 2; 9 upper labials, fourth, fifth, and sixth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are as large as the posterior. Scales in 17 rows. Ventrals 144–169; anal divided; subcaudals 89–145. Brown or blackish above, with two lighter, yellowish or bluish-grey longitudinal streaks each of

which may bear a series of black spots; upper lip with a white, black-edged streak; lower parts yellowish, with a black dot or spot at the outer end of each ventral or subcaudal shield.

Total length 410 millim.; tail 155.

Siam, Malay Peninsula and Archipelago. Recorded from Kelantan, Malacca, and Singapore.

124. *Polyodontophis sagittarius*.

Calanaria sagittaria, Cantor, P. Z. S. 1839, p. 49, and Journ. Asiat. Soc. Bengal, xvi, p. 911 (1847).

Ablabes sagittarius, Günth. Rept. Brit. Ind. p. 227 (1864).

Polyodontophis sagittarius, Bouleng. Faun. Brit. Ind., Rept. p. 303 (1890); id. Cat. Sn. i, p. 187 (1893).

Rostral not twice as broad as deep; suture between the internasals shorter than that between the præfrontals; frontal longer than its distance from the end of the snout, shorter than the parietals; loreal small and longer than deep, or absent; 1 præocular; 2 postoculars, both in contact with the parietal; temporals 1+1 or 1+2+1; 7 or 8 upper labials, third and fourth or fourth and fifth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are about as large as the posterior. Scales in 17 rows. Ventrals 205-236; anal divided; subcaudals 54-70. Yellowish or pale brown, sides brown or grey, separated from the pale dorsal region by a black line; a vertebral series of minute black dots; head and nape dark brown or black, forehead marbled with yellow, and with a large elongate oval patch of yellow on each side of the back of the head; the black nuchal spot more or less distinctly bordered with yellow behind; lower parts yellow, with a black dot at the outer extremity of each ventral shield.

Total length 280 millim.; tail 60.

Western Himalayas, Bengal, Assam. One specimen was obtained in Penang by Dr. Cantor.

Genus **XENOCHROPHIS**.

Günth. Rept. Brit. Ind. p. 273 (1864).

Maxillary teeth about 20, subequal; anterior mandibular teeth largest. Head slightly distinct from neck; eye moderate, with round pupil; nostrils directed upwards, pierced in a single nasal. Body cylindrical; scales keeled, without apical pits, in 19 rows; ventrals rounded. Tail moderate; subcaudals in two rows.

A single species.

125. *Xenochrophis cerasogaster*.

Psammodphis cerasogaster, Cantor, P. Z. S. 1839, p. 52.

Tropidonotus cerasogaster, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 939 (1847).

Xenochrophis cerasogaster, Günth. op. cit. p. 274; Bouleng. Faun. Brit. Ind., Rept. p. 353, fig. (1890); id. Cat. Sn. i, p. 191 (1893).

Head narrow, elongate, with angular canthus rostralis and slightly concave lores. Rostral once and one third to twice as broad as deep; suture between the internasals nearly as long as that between the præfrontals; frontal narrow, much longer than its distance from the end of the snout, as long as the parietals; loreal as long as deep or a little longer than deep; 1 præocular; 2 or 3 postoculars and 1 or 2 suboculars; temporals 2 + 2 or 2 + 3; 9 upper labials, fourth entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are as long

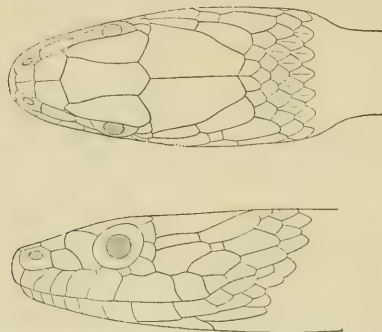


Fig. 41.—Head of *Xenochrophis cerasogaster*.

as or a little shorter than the posterior. Scales strongly keeled, in 19 rows. Ventrals 140–151; anal divided; subcaudals 60–79. Brown above, with or without darker spots and with a more or less distinct paler dorso-lateral stripe; lower parts cherry-red to purplish black, with a yellow stripe on each side extending from the lips to the end of the tail. Iris crimson.

Total length 600 millim.; tail 140.

Oude, Bengal, Assam, Khasi Hills. Recorded from the Province Wellesley by Cantor, and also obtained in Larut, Perak, by Wray.

Genus **TROPIDONOTUS**.

Kuhl, in Férussac, Bull. Sc. Nat. ii, p. 81 (1824).

Maxillary teeth 20 to 30 (40), posterior longest; mandibular teeth subequal. Head more or less distinct from neck; eye moderate or large, with round pupil. Body cylindrical; scales keeled (or smooth), usually with apical pits, in 17 or 19 (15–23) rows; ventrals rounded. Tail moderate or long; subcaudals in two rows.

Europe, Asia, Africa, North Australia, North and Central America.

Usually found in or near the water, and feeding on Batrachians and Fishes. The Old-World species appear to be all oviparous, laying as a rule 20 to 30 eggs with white, parchment-like shell.

Seven species have been found in the Malay Peninsula.

Synopsis of the Species.

- I. Posterior maxillary teeth not abruptly enlarged.

Internasals much narrowed in front; nostrils directed upwards; 1 or 2 labials entering the eye; 2 superposed anterior temporals

T. piscator, p. 123.

Internasals broadly truncate in front; nostrils lateral, between two nasals; 3 labials entering the eye; 2 superposed anterior temporals

T. trianguligerus, p. 125.

Internasals broadly truncate in front; nostrils lateral, in a single nasal; 2 labials entering the eye; a single anterior temporal

T. inas, p. 125.

- II. 2 or 3 last maxillary teeth abruptly enlarged; 3 labials entering the eye.

- A. Eye moderate or large; subcaudals 50-93.

Internasals much narrowed in front, nearly as long as the præfrontals; a single anterior temporal; scales of outer row smooth

T. stolatus, p. 125.

Internasals broadly truncate in front, shorter than the præfrontals; 2 superposed anterior temporals; scales of outer row smooth

T. subminiatus, p. 126.

Internasals broadly truncate in front, as long as the præfrontals; 2 superposed anterior temporals; all the scales strongly keeled

T. chrysargus, p. 127.

- B. Eye very large; subcaudals 95-113; all the scales strongly keeled

T. maculatus, p. 128.

126. *Tropidonotus piscator*.

Hydrus piscator, Schneid. Hist. Amph. i, p. 247 (1799).

Tropidonotus piscator, Boie, Isis, 1827, p. 535; Bouleng. Faun. Brit. Ind., Rept. p. 349 (1890); id. Cat. Sn. i, p. 230 (1893); S. Flower, P. Z. S. 1899, p. 660; Wall, Journ. Nat. Hist. Soc. Bombay, xvii, p. 857, pl. iv (1907).

Tropidonotus quincunciatus, Schleg. Phys. Serp. ii, p. 307, pl. xii, figs. 4 & 5 (1837); Günth. Rept. Brit. Ind. p. 260 (1864).

Tropidonotus umbratus, Schleg. t. c. p. 309; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 936 (1847).

Eye rather small; nostrils turned upwards. Internasals much narrowed anteriorly, subtriangular, as long as the præfrontals; frontal once and two thirds to twice as long as broad, longer than its distance from the end of the snout, as long as or a little shorter than the parietals; loreal nearly as long as deep; 1 præ-

and 3 or 4 postoculars; temporals 2+2 or 2+3 (rarely 1+2); 9 upper labials, fourth or fourth and fifth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales more or less strongly keeled, of 2 or 3 outer rows smooth, in 19 (exceptionally 17) rows. Ventrals 125-150; anal divided; subcaudals 65-90. Yellowish or pale olive-brown above in life, usually with black spots arranged

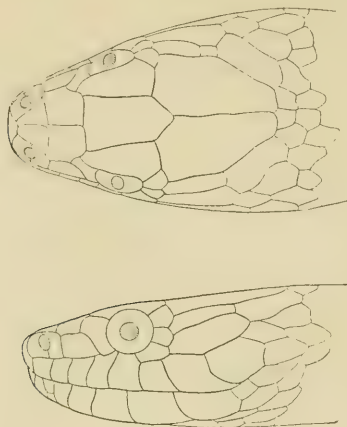


Fig. 42.—Head of *Tropidonotus piscator*.

quincuncially, these spots sometimes so large as to occupy nearly the whole upper surface, which appears black with small yellowish spots; the dark spots sometimes very indistinct; bright scarlet markings sometimes present on the sides; two black streaks on each side of the head, one below and the other behind the eye; sometimes a pair of small black-edged yellow spots close together on the parietal region; yellowish or whitish beneath, the shields often edged with black.

The variety with black stripes (4 on the nape, 5 on the body), *T. melanozostus*, Boie, has not yet been found in the Malay Peninsula.

Total length 1200 millim.; tail 300.

From India and Southern China to the Malay Peninsula and Archipelago.

More thoroughly aquatic than any of its congeners in the Malay Peninsula, feeding on fish and frogs. Capt. Flower observes that when newly caught and frightened it is apt to be fierce, but soon becomes tame in captivity. Most authors agree as to its ferocity. Like most, if not all, of the Indo-Malayan species of this genus, it lays eggs, the number in one clutch being large, up to about 40.

127. *Tropidonotus trianguligerus*.

Boie, Isis, 1827, p. 535; Günth. Rept. Brit. Ind. p. 261 (1864); Bouleng. Cat. Sn. i, p. 224 (1893).

Eye moderate. Rostral nearly twice as broad as deep; internasals longer than broad, trapezoid, as long as or longer than the præfrontals; frontal once and a half to once and three fourths as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal as long as deep, or deeper; 1 (rarely 2) præ- and 3 or 4 postoculars; temporals 2 + 2 or 2 + 3; 9 upper labials, fourth, fifth, and sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales strongly keeled, of outer row smooth or feebly keeled, in 19 rows. Ventrals 134-150; anal divided; subcaudals 67-94. Dark olive above, with small black spots; usually a lateral series of large triangular black spots, with the points extending down to the ventrals, separated by red interspaces; these markings disappearing or becoming indistinct on the posterior half of the body; upper labials yellowish, with black sutures; lower parts yellowish, uniform or the shields edged with black.

Total length 1200 millim; tail 340.

Southern Burma, Malay Peninsula and Archipelago. Abundant throughout the Peninsula in ditches.

128. *Tropidonotus inas*.

Laidlaw, P. Z. S. 1901, ii, p. 576, pl. xxxv, fig. 2.

Eye moderate. Internasals broadly truncate in front, shorter than the præfrontals; frontal once and a half as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal a little longer than deep; 1 præ- and 2 postoculars; temporals 1 + 2; 9 upper labials, fourth and fifth entering the eye. Scales keeled, of outer row smooth, in 19 rows. Ventrals 143; anal divided; subcaudals 96. Brownish black above; a series of ill-defined yellowish spots on each side; a yellowish-white streak from under the eye to the lateral series of spots; ventrals white, with a square black spot on the outer margins.

Total length 272 millim.; tail 125.

Described from a single specimen obtained on Gunong Inas, Perak.

129. *Tropidonotus stolatus*.

Coluber stolatus, Linn. Syst. Nat. i, p. 379 (1766).

Tropidonotus stolatus, Boie, Isis, 1827, p. 535; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 937 (1847); Günth. Rept. Brit. Ind. p. 266 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 348, fig. (1890); id. Cat. Sn. i, p. 253 (1893).

Eye moderate. Rostral twice as broad as deep; internasals much narrowed in front, as long as broad or a little longer,

nearly as long as the præfrontals; frontal once and two thirds to twice as long as broad, longer than its distance from the end of the snout, as long as the parietals; loreal as long as deep or deeper; 1 præ- and 3 postoculars, temporals 1+1 or 1+2; 8 upper labials normally, third, fourth, and fifth entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales strongly keeled, outer row smooth, in 19 rows. Ventrals 120-161; anal divided; subcaudals 50-89. Greenish or brownish olive above, with more or less distinct black spots or reticulated cross-bars intersected by two yellow longitudinal bands,

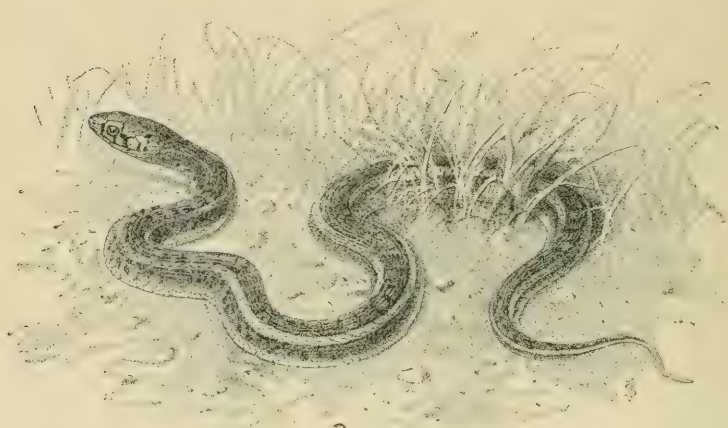


Fig. 43.—*Tropidonotus stotatus*.

which are best marked posteriorly; præ- and postoculars yellowish; lower surfaces white, usually with a black spot on each side of each ventral shield.

Total length 680 millim.; tail 180.

India and Southern China to the Malay Peninsula and Archipelago. On record from Penang and Singapore. Appears to be rare in the Malay Peninsula.

Of gentle habits, feeding on frogs. Eggs few, up to about 10.

The allied *T. vittatus*, L., which inhabits Java and Celebes, has been erroneously reported from Penang by Stoliczka (Journ. Asiat. Soc. Bengal, xlii, 1873, p. 114), who quotes Günther (Colubr. Snakes) as his authority. No such mention, however, occurs in any of Günther's works.

130. *Tropidonotus subminiatus*.

Schleg. Phys. Serp. ii, p. 313 (1837); Günth. Rept. Brit. Ind. p. 265 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 347 (1890); id. Cat. Sn. i, p. 256 (1893); S. Flower, P. Z. S. 1899, p. 662.

Eye moderate or rather large. Rostral twice as broad as deep

internasals broadly truncate in front, shorter than the præfrontals; frontal once and a half to once and two thirds as long as broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep or deeper; 1 præ- and 3 postoculars; temporals $2 + 2$ or $2 + 3$; 8 (rarely 9) upper labials, third, fourth, and fifth entering the eye; 5 (rarely 6) lower labials in contact with the anterior chin-shields, which are usually a little shorter than the posterior. Scales strongly keeled, of outer row smooth, in 19 rows. Ventrals 132-166; anal divided; subcaudals 65-87. Olive-brown, greyish olive, or greenish above, adult uniform or with black and yellow reticulation; neck often tinged with bright vermilion; a dorso-lateral series of light spots may be present; a black oblique spot below the eye, on a white ground, usually present; young with a jet-black cross-band on the nape, bordered with yellow behind; belly yellowish; frequently a black dot on the outer end of each ventral shield.

Total length 1060 millim.; tail 255.

Southern China, Eastern Himalayas, Assam, Burma, Siam, Malay Archipelago. Recorded from Penang and Perak.

Feeds on frogs and toads.

131. *Tropidonotus chrysargus*.

Schleg. Phys. Serp. ii, p. 312, pl. xii, figs. 6 & 7 (1837); Bouleng.

Faun. Brit. Ind., Rept. p. 345 (1890); id. Cat. Sn. i, p. 258 (1893);

S. Flower, P. Z. S. 1899, p. 663.

Tropidonotus juncus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 940 (1847); Günth. Rept. Brit. Ind. p. 268, pl. xxii, fig. F (1864).

Eye large. Rostral twice as broad as long; internasals broadly truncate in front, nearly as long as the præfrontals; frontal once and two thirds to once and three fourths as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal nearly as deep as long; 1 or 2 præ- and 3 postoculars; temporals $2 + 2$ or $2 + 3$; 8 or 9 upper labials, third, fourth, and fifth, or fourth, fifth, and sixth entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales all strongly keeled, in 19 rows. Ventrals 143-175; anal divided; subcaudals 60-93. Brownish or olive-green above, usually with a series of yellow spots or short transverse bars along each side of the back; young with black spots and cross-bars, which become indistinct with age; the skin between the scales sometimes red; upper lip yellow, with the sutures between the shields black, the yellow colour extending as a more or less distinct angular or crescentic band on the nape; belly yellowish, with or without blackish dots, and with a more or less distinct series of small black spots along each side.

Total length 680 millim.; tail 190.

Eastern Himalayas and Southern China to the Malay Peninsula and Archipelago. Known from Penang and the Larut Hills,

Perak, from 3000 to 3400 feet altitude, and from Jalor in the Siamese Malay States, where it was observed to feed on frog spawn.

Of fierce habits, according to Cantor.

132. *Tropidonotus maculatus*.

Edeling, Nederl. Tijdschr. Dierk. ii, p. 203 (1864); Bouleng. Cat. Sn. i, p. 260 (1893).

Form slender. Eye very large. Rostral broader than deep; internasals broadly truncate in front, as long as the præfrontals; frontal once and a half as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal as deep as long, or deeper; 1 præ- and 3 postoculars; temporals 2 + 3; 9 upper labials, fourth, fifth, and sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales all strongly keeled, in 19 rows. Ventrals 144-156; anal divided; subcaudals 95-113. Olive above, with four longitudinal series of small square black spots and two of yellowish ones; upper labials yellowish, with black sutures; lower parts yellowish, the shields edged with black.

Total length 810 millim.; tail 270.

Malay Peninsula (Malacca), Sumatra, Borneo.

Genus **MACROPISTHODON**.

Bouleng. Cat. Sn. i, p. 256 (1893).

Maxillary teeth 12 to 20, followed after an interspace by a pair of extremely large fangs; mandibular teeth subequal. Head distinct from neck; eye moderate or large, with round pupil. Body stout; scales strongly keeled, in 19 (to 27) rows, with apical pits; ventrals rounded. Tail moderate; subcaudals in two rows.

South-Eastern Asia.

Two species in the Malay Peninsula :—

Maxillary teeth 18 to 20 + 2; usually 8 upper labials	<i>M. flaviceps</i> , p. 128.
Maxillary teeth 12 to 15 + 2; usually 7 upper labials	<i>M. rhodomelas</i> , p. 129. *

133. *Macropisthodon flaviceps*.

Amphiesma flaviceps, Dum. & Bibr. Erp. Gén. vii, p. 738 (1854).

Tropidonotus leucomelas, Günth. Rept. Brit. Ind. p. 271, pl. xxii, fig. I (1864).

Macropisthodon flaviceps, Bouleng. Cat. Sn. i, p. 266 (1893).

Maxillary teeth 18 to 20 + 2. Rostral twice as broad as deep; internasals shorter than the præfrontals; frontal a little longer

than broad, as long as or a little shorter than its distance from the end of the snout, shorter than the parietals; loreal as long as deep, or deeper; one præ- and 3 or 4 (rarely 2 or 5) postoculars; temporals 2+2 or 2+3; 8 (rarely 7) upper labials, fourth and fifth (or third and fourth) entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields; posterior chin-shields longer than the anterior. Scales very strongly keeled, in 19 rows. Ventrals 120-138; anal divided; subcaudals 49-60. Body black, young with greyish-white or pale olive cross-bars, widening towards the sides, and of which at least traces persist in the adult; a broad orange band across the nape, sometimes disappearing in the adult, separated from the head, which is yellowish brown or olive, by a broad black band; belly olive, with black cross-bands, or entirely black.

Total length 840 millim.; tail 190.

Malay Peninsula, where it is very common, Sumatra, Borneo.

134. *Macropisthodon rhodomelas*.

Tropidonotus rhodomeias, Boie, Isis, 1827, p. 535.

Macropisthodon rhodomelas, Bouleng. Cat. Sn. i, p. 266 (1893); S.

Flower, P. Z. S. 1896, p. 880, and 1899, p. 664; Ridley, Journ. Straits Branch Roy. Asiat. Soc. 1899, p. 198.

Maxillary teeth 12 to 15+2. Rostral at least twice as broad as deep; internasals shorter than the præfrontals; frontal once and one fourth to once and one third as long as broad, a little longer than its distance from the end of the snout, a little shorter than the parietals; loreal as long as deep or a little deeper; one præocular, usually with a small subocular below it; 3 or 4 postoculars; temporals 2+2, 2+3, or 3+3; 7 (rarely 8) upper labials, third and fourth (or fourth and fifth) entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields; both pairs of chin-shields broad and subequal in length, or hinder pair the longer. Scales strongly keeled, in 19 rows. Ventrals 124-138; anal divided; subcaudals 42-58. Greyish or pale reddish brown above, with a dark brown or black vertebral stripe, which expands into a V-shaped bluish blotch on the nape; lips, throat, and sides of belly pink, middle of belly yellow; a series of small black spots along each side of the belly.

Total length 520 millim.; tail 85.

Malay Peninsula (Pahang, Perak, Selangor, Patani, Kelantan, Singapore) and Archipelago. Rarer than the foregoing species.

Common at Singapore, in short grass and among low bushes.

According to Ridley, "its peculiarity is its means of defence. When vexed, it sits up after the manner of a cobra, and seems to flatten out its neck as if it were trying to imitate that species, while from the bluish patch on its neck are exuded some drops

of a white viscid liquid representing the well-known cobra marks, I noticed that my dog, seizing this snake in its mouth to worry it, presently foamed at the mouth, as if he had been licking a toad, and soon dropped the snake. I tasted the exudation, and found it bitter, but it had no effect on my salivary glands."

Genus **HELICOPS**.

Wagler, Syst. Amph. p. 170 (1830).

Maxillary teeth 18-25, posterior longest; mandibular teeth subequal. Head not, or but slightly distinct from neck; eye moderate (or small), with round pupil; nostril directed upwards, in a semidivided nasal; a single internasal. Body cylindrical; scales usually striated and keeled, without apical pits, in 19 (to 25) rows; ventrals rounded. Tail moderate; subcaudals in two rows.

South-Eastern Asia, Africa, America.

A single species in the Malay Peninsula.

135. *Helicops schistosus*.

Coluber schistosus, Daud. Hist. Rept. vii, p. 132 (1803).

Tropidonotus schistosus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 938 (1847).

Atretium schistosum, Günth. Rept. Brit. Ind. p. 273 (1864).

Helicops schistosus, Jan, Elenco, p. 76 (1863); Bouleng. Faun. Brit. Ind., Rept. p. 352 (1890); id. Cat. Sn. i, p. 274 (1893).

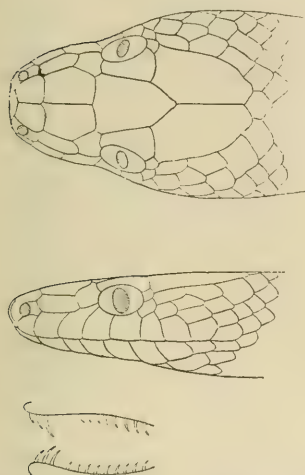
Rostral broader than deep, forming a narrow suture with the internasal; frontal nearly twice as long as broad, much longer than its distance from the end of the snout, shorter than the parietals; loreal deeper than long; 1 præ- and 2 or 3 post-oculars; temporals 2 + 2; 8 or 9 upper labials, third and fourth or fourth and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales more or less distinctly keeled, in 19 rows. Ventrals 129-160; anal divided; subcaudals 55-85. Olive-brown above, uniform or with two series of small black spots along the back; a more or less distinct dark lateral streak; upper lip, outer row of scales, and lower parts yellow or orange.

Total length 750 millim.; tail 180.

India and Ceylon, S. China, Burma, and Malay Peninsula. Obtained at Penang by Cantor, who describes this snake as very fierce, preparing to attack by raising the head three or four inches vertically from the ground, and having the power of flattening and laterally expanding the skin of the anterior part of the body like a cobra, but in a much slighter degree. Feeds on frogs and fishes. In Ceylon it is found chiefly in rivers and streams.

Genus **LYCODON**.

Boie, Isis, 1827, p. 521.

Fig. 44.—Head and dentition of *Lycodon aulicus*.

Maxillary bent inwards anteriorly in the adult, the 3 to 6 anterior teeth increasing in size, fang-like, and separated by a toothless interspace from the rest, 7 to 15 in number, which increase in size posteriorly; anterior mandibular teeth longest, fang-like. Head not or but slightly distinct from neck, more or less strongly depressed; eye small or moderate, with vertically elliptic pupil. Body more or less elongate, cylindrical or slightly compressed; scales smooth or feebly keeled, in 17 (or 19) rows, with apical pits. Tail moderate; subcaudals single or double.

Southern Asia.

Five species are known to inhabit the Malay Peninsula.

These snakes are nocturnal and oviparous.

Synopsis of the Species.

- I. A præocular, separating the eye from the præfrontal.
 - A. Scales smooth.
 - Loreal present, extensively in contact with the internasal; anal divided. *L. aulicus*, p. 131.
 - Loreal present, not or but slightly in contact with the internasal; anal divided. *L. laoensis*, p. 132.
 - Loreal absent, præfrontal in contact with the labials; anal entire. *L. effrenis*, p. 132.
 - B. Scales very feebly keeled. *L. butleri*, p. 133.
- II. No præocular; præfrontal entering the eye; scales feebly or faintly keeled. *L. subcinctus*, p. 133.

136. *Lycodon aulicus*.

Coluber aulicus, Linn. Syst. Nat. i, p. 381 (1766).

Lycodon aulicus, Boie, Isis, 1827, p. 551; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 915 (1847); Günth. Rept. Brit. Ind. p. 199 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 294 (1890); id. Cat. Sn. i, p. 352 (1893); S. Flower, P. Z. S. 1899, p. 664; Wall, Journ. Nat. Hist. Soc. Bombay, xix, p. 87, pl. ix (1909).

Snout much depressed, spatulate in the adult. Rostral much

broader than deep; internasals much shorter than the præfrontals; frontal once and one third to once and two thirds as long as broad, usually shorter than its distance from the end of the snout, shorter than the parietals; loreal elongate, not entering the eye, extensively in contact with the internasal; one præocular, usually in contact with the frontal; 2 (rarely 3) postoculars; temporals small, 2 + 3 or 3 + 3; 9 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales smooth, in 17 rows. Ventrals 178-224, obtusely angulate laterally; anal divided; subcaudals 57-80. Brown above, with fine yellow reticulations; a yellow collar or a triangular yellow blotch on each side of the occiput; back often with yellow cross-bands bifurcating on the sides, or with a dorsal series of quadrangular yellow blotches; labials yellow, some or all of them with a brown spot; uniform white or pale yellow.

Total length 510 millim.; tail 110.

India and Ceylon, Burma and Cochin China to Malay Peninsula and Archipelago. Recorded from Penang, Singapore, and Kui; not unfrequently found in inhabited houses. Lays 3 to 9 eggs.

137. *Lycodon laoensis*.

Günth. Rept. Brit. Ind. p. 317 (1864); Bouleng. Cat. Sn. i, p. 354 (1893); Laidlaw, P. Z. S. 1901, ii, p. 576.

Snout much depressed but not spatulate. Rostral much broader than deep; internasals much shorter than the præfrontals; frontal once and one third to once and a half as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal elongate, separated from or but just touching the internasals; one præocular, in contact with the frontal; 2 postoculars; temporals small, 2 + 3; 9 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales smooth, in 17 rows. Ventrals 175-185, obtusely angulate laterally; anal divided; subcaudals 67-73. Dark brown above, with a whitish cross-band on the occiput and others on the back, which bifurcate on the sides; lower parts white.

Total length 470 millim.; tail 100.

Siam, Malay Peninsula (Kota Bharu, Kelantan and Jalor, Patani States).

138. *Lycodon effrenis*.

Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 917, pl. xl, fig. 2 (1847); Bouleng. Cat. Sn. i, p. 356 (1893).

Tetragonosoma effrene, Günth. Rept. Brit. Ind. p. 320, pl. xxiv, fig. K (1864).

Snout much depressed, subspatulate. Rostral twice as broad as deep; internasals half as long as the præfrontals; frontal once

and a half to once and two thirds as long as broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; no loreal; præfrontal in contact with the second and third labials; a præocular, not reaching the frontal; 2 or 3 postoculars; temporals 2+3 or 3+3; 9 upper labials, third, fourth, and fifth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Body slender. Scales smooth, in 17 rows. Ventrals 215-228, angulate laterally; anal entire; subcaudals 75-98. Brown above and below, with a few distant yellowish-white rings, some or all of which may become obsolete in the adult; young with a yellowish streak on each side of the top of the head.

Total length 700 millim.; tail 170.

Cantor's type is from the Great Hill of Penang, and a specimen was obtained in Kelantan by Dr. Gimlette. The species occurs also in Sumatra and Borneo.

139. *Lycodon butleri*.

Bouleng. Ann. Mag. Nat. Hist. (7) vi, p. 193 (1900); id. Journ. Nat. Hist. Soc. Bombay, xiii, p. 336 (1900).

Rostral twice as broad as deep; internasals shorter than the præfrontals; frontal a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal more than twice as long as deep, bordering the eye below the single præocular; 2 postoculars; temporals 2 + 2; 8 upper labials, third, fourth and fifth entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are as long as the posterior. Body slightly compressed; scales in 17 rows, dorsals very feebly keeled. Ventrals 228, strongly angulate laterally; anal entire; subcaudals 88. Blackish brown above and beneath, with 43 rather irregular annuli of whitish spots or light edges to the scales.

Total length 540 millim.; tail 115.

Discovered in Perak, Larut Hills, at an altitude of 5000 feet, where it is very common, by Mr. A. L. Butler.

140. *Lycodon subcinctus*.

Boie, Isis, 1827, p. 551; Bouleng. Cat. Sn. i, p. 359 (1893); S. Flower, P. Z. S. 1899, p. 665.

Lycodon platurinus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 916 (1847).

Ophites subcinctus, Günth. Rept. Brit. Ind. p. 322 (1864).

Snout much depressed, broad but not spatulate. Rostral much broader than deep; internasals much shorter than the præfrontals; frontal slightly longer than broad, shorter than its distance from the end of the snout, much shorter than the parietals; loreal

elongate, usually entering the eye, widely separated from the internasal; no præocular; 2 or 3 postoculars; temporals 1 + 2; 8 upper labials, third, fourth, and fifth (sometimes also the sixth) entering the eye; 4 lower labials in contact with the anterior chin-shields, which are usually longer than the posterior. Scales in 17 rows, dorsals feebly or faintly keeled. Ventrals 198-230, angulate laterally; anal divided (rarely entire); subcaudals 61-90. Dark brown or purplish black above, brown or yellowish brown below, with a white occipital blotch and widely separated white rings on the body and tail; these markings become less distinct or entirely disappear in the adult.

Total length 1000 millim.; tail 180.

Malay Peninsula and Archipelago. Known from Penang, Perak (Larut Hills (4400 feet), Taiping); Johore Bahru, Kuala Teku, Pahang; Kemaman, Kelantan, and Singapore.

Feeds on lizards.

As Capt. Flower remarks, the similarity in colouring of this harmless snake and the larger poisonous *Bungarus candidus* is worthy of notice.

Genus **DRYOCALAMUS**.

Günth. Cat. Col. Sn. p. 121 (1858).

Maxillary teeth 8 to 10, rather short but stout, increasing in size posteriorly; anterior mandibular teeth a little longer than the posterior; one or two more or less distinct tooth-like knobs on the basisphenoid. Head distinct from neck, much depressed; eye moderate or rather large, with vertically elliptic pupil. Body slender, slightly compressed; scales smooth, in 13 or 15 rows, with apical pits; ventrals strongly keeled on each side. Tail moderate: subcaudals in two rows.

South-Eastern Asia. A single species in the Malay Peninsula.

141. *Dryocalamus subannulatus*.

Odontomus subannulatus, Dum. & Bibr. Exp. Gén. vii, p. 454 (1854).

Nymphophidium maculatum, Günth. Rept. Brit. Ind. p. 235, pl. xix, fig. H (1864).

Hydrophobus subannulatus, Bouleng. Faun. Brit. Ind., Rept. p. 297 (1890).

Dryocalamus subannulatus, Bouleng. Cat. Sn. i, p. 371 (1893).

Rostral not twice as broad as deep, visible from above; suture between the internasals as long as or longer than that between the præfrontals; frontal once and a half as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal longer than deep, entering the eye; 1 præ- and 2 post-

oculars; temporals 2 + 2; 7 upper labials, third and fourth entering the eye; 3 or 4 lower labials in contact with the anterior chin-shields. Scales in 15 rows. Ventrals 225-244; anal entire; subcaudals 93-107. Pale brownish above, with a dorsal series of large brown transverse spots, and, on each side, a series of small



Fig. 45.—*Dryocalamus subannulatus*.

Head and anterior part of body of type specimen. (After Sordelli.)

spots alternating with the dorsals; a brown band across the præfrontals, another between the eyes, and a large brown blotch on the parietals; yellowish beneath.

Total length 295 millim.; tail 170.

Malay Peninsula (Penang, Prov. Wellesley, Singapore), and Sumatra.

Genus ZAOCYS.

Cope, Proc. Ac. Philad. 1860, p. 563.

Maxillary teeth 20 to 33, increasing in size posteriorly; mandibular teeth subequal. Head elongate, distinct from neck; eye large, with round pupil; a subocular below the præocular. Body elongate, a little compressed; scales smooth or keeled, with apical pits, in 16 or 18 (or 14) rows; ventrals rounded. Tail long; subcaudals in two rows.

South-Eastern Asia.

Two species are known from the Malay Peninsula:—

Two or four median rows of scales keeled; subcaudals 110-118	<i>Z. carinatus</i> , p. 135.
Scales all smooth; subcaudals 160-165	<i>Z. fuscus</i> , p. 136.

Like the Rat-snakes these large snakes are sometimes mistaken for the Hamadryad, *Naja bungarus*.

142. *Zaocys carinatus*.

Coryphodon carinatus, Günth. Cat. Col. Sn. p. 112 (1858).

Zaocys carinatus, Günth. Rept. Brit. Ind. p. 256 (1864); Bouleng. Cat. Sn. i, p. 377, pl. xxvii, fig. 1 (1893).

Rostral broader than deep, visible from above; internasals shorter than the præfrontals; frontal a little longer than broad, as long as its distance from the rostral, a little shorter than the parietals;

2 or 3 loreals; 1 præocular, with a subocular below it; 2 postoculars; temporals 2+2; 9 upper labials, fifth and sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales in 16 or 18 rows, 2 or 4 middle rows keeled. Ventrals 208-215; anal divided; subcaudals 110-118. Brownish olive or blackish anteriorly, with yellowish spots or irregular cross-bands, yellowish or pale brown posteriorly with a large deep-black network; lower parts yellowish anteriorly, black and yellow posteriorly.

Total length 3000 millim.; tail 750.

Malay Peninsula (Perak, Singapore), Sumatra, Borneo.

143. *Zaocys fuscus*.

Coryphodon fuscus, Günth. Cat. Col. Sn. p. 112 (1858).

Zaocys fuscus, Günth. Rept. Brit. Ind. p. 256 (1864); Bouleng.

Cat. Sn. i, p. 378, pl. xxvii, fig. 2 (1893).

Rostral a little broader than deep, visible from above; internasals shorter than the præfrontals; frontal a little longer than broad, as long as its distance from the rostral or the end of the snout, a little shorter than the parietals; 3 loreals; 1 præocular, with 1 or 2 small suboculars below it; 2 postoculars; temporals 2+2; 9 upper labials, fifth and sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales smooth, in 16 rows. Ventrals 189-198; anal divided; subcaudals 160-165. Olive or olive-brown above, with or without a brick-red vertebral line; a black lateral band along the posterior part of the body and along the tail, extending to the outer ends of the ventral and subcaudal shields; lower parts pale yellow.

Total length 2900 millim.; tail 1000.

Penang, Malay Peninsula, Sumatra, Borneo.

A specimen obtained on Penang Hill, at an elevation of 1900 feet, by Capt. Flower, had in its stomach a recently swallowed frog, *Megalophrys nasuta*.

Genus **ZAMENIS**.

Wagler, Syst. Amph. p. 188 (1830).

Maxillary teeth 12 to 20, increasing in size posteriorly; mandibular teeth subequal, or anterior slightly enlarged. Head elongate, distinct from neck; eye moderate or large, with round pupil; usually one or more suboculars. Body elongate, cylindrical; scales smooth or feebly keeled, with apical pits, in 15 to 23 (13 to 43) rows; ventrals rounded or with an obtuse lateral keel. Tail moderate or long; subcaudals in two rows.

Europe, Asia, North Africa, North and Central America.

Three species in the Malay Peninsula:—

Scales in 15 rows; ventrals 160-177	<i>Z. korros</i> , p. 137.
Scales in 17 rows; ventrals 187-208	<i>Z. mucosus</i> , p. 137.
Scales in 21 or 23 rows; ventrals 197-225.....	<i>Z. fasciolatus</i> , p. 138.

144. *Zamenis korros*.

Coluber korros, Schleg. Phys. Serp. ii, p. 139 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 121 (1847).

Ptyas korros, Günth. Rept. Brit. Ind. p. 250 (1864).

Zamenis korros, Bouleng. Faun. Brit. Ind., Rept. p. 324 (1890); id. Cat. Sn. i, p. 384 (1893); S. Flower, P. Z. S. 1899, p. 666.

Eye very large. Rostral a little broader than deep; internasals shorter than the præfrontals; frontal $1\frac{1}{2}$ to $1\frac{2}{3}$ times as long as broad, as long as its distance from the end of the snout, or a little longer, and as long as the parietals; usually 2 or 3 loreals; one large præocular, usually not touching the frontal, with a small subocular below it; 2 postoculars; temporals 2 + 2; 8 upper labials, fourth and fifth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 15 rows, smooth, or feebly keeled on the posterior part of the back in the adult. Ventrals 160-177; anal divided; subcaudals 122-145. Brownish or olive above, the scales on the posterior part of the body and on the tail often yellow and edged with black; lower parts yellow; young with transverse series of roundish pearl-coloured spots, or with narrow yellow cross-bars.

Total length 1780 millim.; tail 700.

Southern China and Eastern Himalayas to the Malay Peninsula and Archipelago. Recorded from Penang, Patani, Perak, Prov. Wellesley, Selangor, Kelantan, and Singapore. Common everywhere.

A powerful snake, feeding on frogs, birds, and especially rats, whence the name of Rat-snake given to this and the following species. Possesses, like other species of this and the preceding genus, a superficial resemblance to the Hamadryad.

145. *Zamenis mucosus*.

Coluber mucosus, Linn. Syst. Nat. i, p. 388 (1766).

Coluber dhumma, Cantor, P. Z. S. 1839, p. 51.

Ptyas mucosus, Günth. Rept. Brit. Ind. p. 249 (1864).

Zamenis mucosus, Bouleng. Faun. Brit. Ind., Rept. p. 324 (1890);

id. Cat. Sn. i, p. 385 (1893); S. Flower, P. Z. S. 1899, p. 666;

Wall, Journ. Nat. Hist. Soc. Bombay, xvii, p. 259, pl. iii (1906).

Eye very large. Rostral a little broader than deep; internasals shorter than the præfrontals; frontal $1\frac{1}{4}$ to $1\frac{1}{2}$ times as long as broad, as long as its distance from the end of the snout, as long as the parietals, or slightly shorter; usually 3 loreals; one large

præocular, not touching the frontal, with a small subocular below it; 2 postoculars; temporals 2 + 2; 8 upper labials, fourth and fifth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 17 rows, more or less distinctly keeled on the posterior part of the back. Ventrals 187-208; anal divided; subcaudals 95-140. Light yellowish brown to olive-brown above, frequently with more or less distinct black cross-bands on the posterior part of the body and on the tail; young usually with light cross-bands on the front half of the body; labial shields yellow, edged with black; pale yellow beneath, the posterior ventral and subcaudal shields often edged with black.

Total length 2280 millim.; tail 550.

From Transcaspia and Afghanistan through India and Ceylon to Southern China and the Malay Peninsula.

This Rat Snake is less generally distributed than the preceding species. It is fierce when newly caught, but may become very tame in captivity. When angry it utters a curious sound, audible some yards off, described by Capt. Flower as "roaring," or something like the deep growling of a big dog. Capt. Flower adds that it also rears up its head like a cobra and dilates its neck in such a way that the ventral shields are thrust out and become acutely keeled, whilst the skin on the sides of the neck is widely stretched. This snake is said to grow to 11 feet 9 inches. It lays 8 to 16 eggs.

146. *Zamenis fasciolatus*.

Coluber fasciolatus, Shaw, Zool. iii, p. 528 (1802); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 919 (1847).

Zamenis fasciolatus, Günth. Rept. Brit. Ind. p. 254, pl. xxi, fig. F (1864); Bouleng. Faun. Brit. Ind., Rept. p. 327 (1890); id. Cat. Sn. i, p. 404 (1893).

Snout curved and projecting; eye moderate. Rostral large, broader than deep, the portion visible from above more than half its distance from the frontal; internasals as long as the præfrontals; frontal $1\frac{1}{4}$ to $1\frac{1}{2}$ times as long as broad, nearly as long as its distance from the end of the snout, or as the parietals; a single loreal; one præocular, in contact with the frontal, usually with a small subocular below it; 2 or 3 postoculars; temporals 2+2 or 2+3; 8 upper labials, fourth and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are about the same length as the posterior. Scales in 21 or 23 rows, smooth. Ventrals 197-225; anal divided; subcaudals 73-92. Yellowish or brownish olive above, with narrow white, brown, and black variegated cross-bands on the anterior half of the body; these bands may entirely disappear in the adult; lower parts uniform yellowish.

Total length 1060 millim.; tail 220.

This species inhabits India. A young specimen was obtained by Dr. Cantor in the Province Wellesley.

Genus **XENELAPHIS.**

Günth. Rept. Brit. Ind. p. 250 (1864).

Maxillary teeth 25 to 30, generally increasing in size; anterior mandibular teeth a little enlarged. Head moderately elongate, distinct from neck; eye moderate, with round pupil; a subocular below the præocular. Body elongate, cylindrical; scales smooth, with feebly marked apical pits, in 17 rows, the vertebral row slightly enlarged and six-sided; ventrals rounded. Tail long; subcaudals in two rows.

A single species.

147. **Xenelaphis hexagonotus.**

Coluber hexagonotus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 921 (1847).

Xenelaphis hexagonotus, Günth. Rept. Brit. Ind. p. 251, pl. xxi, fig. C (1864); Bouleng. Faun. Brit. Ind., Rept. p. 336 (1890); id. Cat. Sn. ii, p. 8 (1894); S. Flower, P. Z. S. 1896, p. 882.

Rostral broader than deep; internasals as long as or a little longer than the præfrontals; frontal $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal nearly as long as deep; one præocular, with a rather large subocular below it; 2 postoculars and a large subocular; a third subocular occasionally present, separating the eye from the labials; temporals 2+2; normally 8 upper labials, fourth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 17 rows. Ventrals 185-198; anal divided; subcaudals 140-179. Brown above, with black cross-bands, which become indistinct with age, on the anterior half of the body, old specimens showing mere traces of the outer ends of these bands; lower parts uniform yellowish.

Total length 1650 millim.; tail 600.

Burma, Malay Peninsula and Archipelago. On record from Penang, Pahang, Prov. Wellesley, and Singapore.

Genus **COLUBER.**

Linn. Syst. Nat. i, p. 375 (1766).

Maxillary teeth 12 to 22, subequal in size; anterior mandibular teeth longest. Head elongate, distinct from neck; eye moderate or rather large, with round pupil. Body elongate,

cylindrical or feebly compressed; scales smooth or keeled, with apical pits, in 19 to 27 (15 to 35) rows; ventrals rounded or angulate laterally. Tail moderate or long; subcaudals in two rows.

Europe, Asia, North and Tropical America.

Five species in the Malay Peninsula.

/ Graceful, bold, and aggressive / snakes, feeding chiefly on 'mammals and birds, which they kill by constriction.' Oviparous.

Synopsis of the Species.

I. Scales in 19 rows.

Scales smooth; ventrals 190-218, not angulate laterally; anal divided; subcaudals 52-76 . *C. porphyraceus*, p. 140.

Scales keeled; all caudal scales keeled; ventrals 193-234, angulate laterally; anal entire; subcaudals 89-115 *C. melanurus*, p. 141.

Scales keeled, outer caudals smooth; ventrals 224-245, angulate laterally; anal entire; subcaudals 85-100. *C. radiatus*, p. 141.

II. Scales in 23-27 rows, smooth or feebly keeled; ventrals 230-305, angulate laterally.

Frontal longer than broad; subcaudals 89-114 *C. tenuis*, p. 142.

Frontal as long as broad, or a little longer; subcaudals 122-149 *C. oxycephalus*, p. 143.

148. *Coluber porphyraceus*.

Cantor, P. Z. S. 1839, p. 51; Günth. Rept. Brit. Ind. p. 239, pl. xx, fig. J (1864); Bouleng. Cat. Sn. ii, p. 34 (1894).

Psammophis nigrofasciatus, Cantor, t. c. p. 53.

Ablables porphyraceus, Bouleng. Faun. Brit. Ind., Rept. p. 308 (1890).

Rostral nearly twice as broad as deep; internasals shorter than the præfrontals; frontal broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal rather small, longer than deep; a large præocular; 2 post-oculars; temporals 1+2; 8 upper labials, fourth and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales smooth, in 19 rows. Ventrals rounded, 190-218; anal divided; subcaudals 52-76. Red or pale reddish brown above, with dark brown black-edged cross-bands; a black streak along the middle of the head, and another on each side, from the eye to the first transverse band; the whole or posterior part of body and tail with two longitudinal black lines, in addition to the cross-bands; lower parts uniform yellow.

Total length 760 millim.; tail 140.

Eastern Himalayas, hills of Assam, Burma, Yunnan, Malay Peninsula, Sumatra. The type of Cantor's *Psammophis nigrofasciatus* is from Singapore.

149. *Coluber melanurus*.

Schleg. Phys. Serp. ii, p. 141, pl. v, figs. 11 & 12 (1837); Bouleng. Faun. Brit. Ind., Rept. p. 334 (1890); id. Cat. Sn. ii, p. 60 (1894).

Compsosoma melanurum, Günth. Rept. Brit. Ind. p. 244 (1864).

Malay name, *Ular tikus*.

Rostral broader than deep; internasals shorter than the præfrontals; frontal $1\frac{1}{6}$ to $1\frac{1}{3}$ times as long as broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal not or but slightly longer than deep; a large præocular; 2 postoculars; temporals 2+2 or 2+3; 9 upper labials, fourth to sixth entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 19 rows, rather strongly keeled; all caudal scales keeled. Ventrals with an obtuse lateral keel, 193-234; anal entire; subcaudals 89-115. Grey or pale brown anteriorly, with a yellow or reddish, black-edged vertebral stripe, which becomes gradually more and more indistinct towards the hinder part of the body, which, like the tail, is darker brown or black; a series of black spots on each side of the anterior part of the body, of ocelli with bright yellow centres in the young; some adults nearly uniform blackish brown; a black streak below the eye; an oblique black streak from the eye to the mouth, and another on the temple and neck.

Total length 1800 millim.; tail 400.

Southern China and Burma to Malay Peninsula and Archipelago. Generally distributed in the Malay Peninsula.

150. *Coluber radiatus*.

Schleg. Phys. Serp. ii, p. 135, pl. v, figs. 5 & 6 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 920 (1847); Bouleng. Faun. Brit. Ind., Rept. p. 333 (1890); id. Cat. Sn. ii, p. 61 (1894).

Compsosoma radiatum, Günth. Rept. Brit. Ind. p. 243 (1864).

Malay name, *Ular tahi kerbau*.

Rostral a little broader than deep; internasals shorter than the præfrontals; frontal $1\frac{1}{6}$ to $1\frac{1}{2}$ times as long as broad, as long as or a little shorter than its distance from the end of the snout, shorter than the parietals; loreal usually longer than deep; a large præocular; 2 postoculars; temporals usually 2+2; 8 or 9 upper labials, third to fifth, fourth and fifth, or fourth to sixth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 19 rows, more or less strongly keeled on posterior half of body, outer series smooth. Ventrals with an obtuse lateral keel, 224-245; anal entire; subcaudals 85-100. Yellowish brown above, with one or two black stripes on each side of the anterior half of the back, the lower usually broken up; a black line across the occiput; three

black lines radiating from the eye; lower parts uniform yellow or speckled with olive.

Total length 1610 millim.; tail 330.

From Southern China, the Eastern Himalayas, and Bengal to the Malay Peninsula and Archipelago. Recorded from Penang, Prov. Wellesley, Jalor, Kelantan, and Singapore. According to Laidlaw, it is common in houses in Patani, where it is called the Rat-snake, "*Ular tikus*," which is used as a general term for all non-poisonous carnivorous snakes of considerable size.

151. *Coluber tæniurus*.

Elaphis tæniurus, Cope, Proc. Ac. Philad. 1860, p. 565; Günth. Rept. Brit. Ind. p. 242 (1864).

Elaphis grabowskyi, Fisch. Arch. f. Nat. 1885, p. 59, pl. iv, fig. 3.

Coluber tæniurus, Bouleng. Faun. Brit. Ind., Rept. p. 333 (1890); id. Cat. Sn. ii, p. 47 (1894); Ridley, Journ. Straits Branch Roy. Asiat. Soc. 1898, p. 99; S. Flower, P. Z. S. 1899, p. 668; Bouleng. Fascic. Malay., Zool. i, p. 162, and Journ. Fed. Malay States Mus. iii, p. 68 (1908).

Coluber tæniurus, var. *ridleyi*, Butler, Journ. Nat. Hist. Soc. Bombay, xii, p. 426 (1899).

Malay name, *Ular bulan* (Moon-snake).

Rostral broader than deep; internasals much shorter than the præfrontals; frontal $1\frac{1}{3}$ to $1\frac{2}{3}$ times as long as broad, as long as

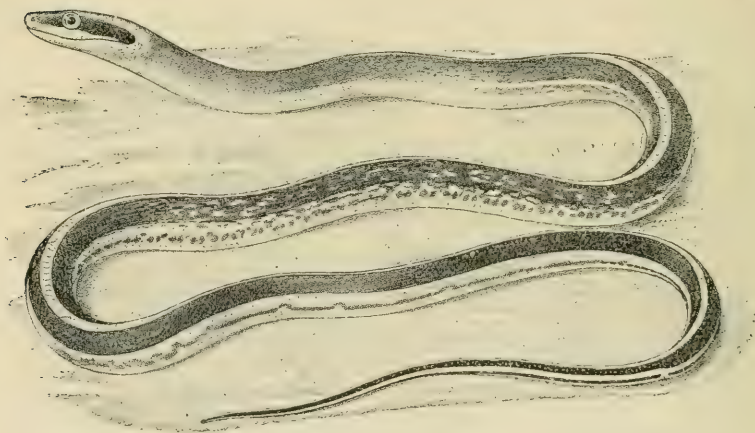


Fig. 46.—*Coluber tæniurus*.

Young from Kuala Teku, Pahang.

or shorter than its distance from the end of the snout, as long as or a little shorter than the parietals; loreal longer than deep; a large præocular, sometimes in contact with the frontal, usually

with a small subocular below it; 2 postoculars; temporals 2+2 or 2+3; usually 9 (sometimes 8) upper labials, fifth and sixth (or fourth and fifth) entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are as long as or a little longer than the posterior. Scales in 23 or 25 rows, dorsals feebly but distinctly keeled, outer rows smooth. Ventrals distinctly angulate laterally, 230-305 (279-305 in Malay specimens); anal divided, rarely entire; subcaudals 89-114. Typical form grey-brown or olive above, head and nape uniform; a black stripe on each side of the head, passing through the eye; anterior part of back with black transverse lines or network, posterior part with a pale vertebral stripe between two broad black ones; belly yellowish anteriorly, greyish posteriorly; a black stripe along each side of the posterior part of the belly and along each side of the tail, separated from the upper lateral stripe by a whitish streak. Specimens living in caves (var. *ridleyi*) are much paler, the neck and back of a pale ochreous colour, without dark transverse lines or network, each scale tipped with isabelline, and the under parts are yellowish white; along the sides runs a purplish-grey band, becoming darker, or black, towards the tail; head bluish grey above.

Total length 2000 millim.; tail 400.

Northern China and Eastern Himalayas to Malay Peninsula, Sumatra, and Borneo. In the Malay Peninsula this handsome snake is found in all limestone caves of any size, living often in total darkness and feeding on bats which it kills by constriction, and harmonising in colour with its surroundings, though it is frequently found lying asleep or gorged on the dark brown guano, when it is extremely conspicuous. Specimens have, however, been found, far away from caves, in Johore, Selangor, and Pahang.

152. *Coluber oxycephalus*.

Boie, Isis, 1827, p. 537; Bouleng. Faun. Brit. Ind., Rept. p. 335 (1890); id. Cat. Sn. ii, p. 56 (1894); S. Flower, P. Z. S. 1899, p. 668; Bouleng. Journ. Fed. Malay States Mus. iii, p. 68 (1908). *Herpetodryas oxycephalus*, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 927 (1847).

Gonyosoma oxycephalum, Günth. Rept. Brit. Ind. p. 294 (1864).

Malay name, *Ular selenseng*.

Body rather compressed. Snout subacuminate, elongate, obliquely truncate and projecting; rostral nearly as deep as broad; internasals $\frac{1}{2}$ to $\frac{2}{3}$ as long as the præfrontals; frontal as long as broad, or a little longer, as long as its distance from the rostral or the end of the snout, a little shorter than the parietals; loreal very elongate; a large præocular, in contact with the frontal; 2 postoculars; temporals 2+3; 9 to 11 upper labials, 2 (rarely 3) entering the eye; 6 lower labials in contact with the anterior chin-shields, which are much longer than the

posterior. Scales in 23 to 27 rows, smooth or faintly keeled. Ventrals with a lateral keel, 233-263; anal divided; subcaudals 122-149. Bright green above, the scales usually finely edged with black; yellow or pale green below; a blackish streak along each side of the head, passing through the eye; tail usually yellowish brown, with or without vermilion bands.

Total length 2300 millim.; tail 480.

Eastern Himalayas, Burma, Malay Peninsula and Archipelago. Of universal occurrence in the Malay Peninsula.

Genus **GONYOPHIS.**

Bouleng. Ann. & Mag. Nat. Hist. (6) viii, p. 290 (1891)

Maxillary teeth 23, equal; mandibular teeth subequal. Head elongate, distinct from neck; eye moderate, with round pupil. Body elongate, compressed; scales feebly keeled, with apical pits, in 19 rows; ventrals with a suture-like lateral keel, and a notch on each side corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals.

A single species.

153. *Gonyophis margaritatus.*

Gonyosoma margaritatum, Peters, Mon. Berl. Ac. 1871, p. 578.

Gonyophis margaritatus, Bouleng. Ann. Mag. Nat. Hist. (6) viii, 1891, p. 290; id. Cat. Sn. ii, p. 71 (1894); id. Journ. Fed. Malay States Mus. iii, p. 68 (1908).

Rostral broader than deep; internasals as long as broad, shorter than the præfrontals; frontal a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal longer than deep; a præocular, not in contact with the frontal, or just touching; 2 postoculars; temporals 2+2 or 3; 9 upper labials, fourth to sixth, or fifth and sixth, entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as the posterior. Scales in 19 rows, feebly keeled. Ventrals 230-249; anal divided; subcaudals 108-130. Black above, each scale with a yellowish-green spot, or green with black borders to the scales; hinder part of body and tail with bright orange rings; lower parts yellowish, the shields with or without a black edge; a black streak on each side of the head behind the eye, and another along the suture between the parietals.

Total length 1530 millim.; tail 370.

This snake, first described from Borneo, has been found in Singapore, on Gunong Tahan, Pahang, 3000 feet, on Kelantan, and near Kuala Lumpur, Selangor.

Genus **DENDROPHIS.**

Boie, Isis, 1827, p. 520.

Maxillary teeth 20 to 33, the posterior more or less enlarged, stouter if not longer than the rest; anterior mandibular teeth longest. Head more or less elongate, distinct from neck; eye large, with round pupil. Body elongate, more or less compressed; scales smooth, in (13 or) 15 rows, narrow, disposed obliquely, with apical pits, those of the vertebral row more or less enlarged; ventrals with a suture-like lateral keel and a notch on each side, corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals.

South-Eastern Asia, Papuasia, and Australia.

Two species in the Malay Peninsula:—

- Eye as long as its distance from the nostril;
 2 postoculars *D. pictus*, p. 145.
 Eye longer than its distance from the nostril;
 3 (rarely 2 or 4) postoculars *D. formosus*, p. 146.

154. **Dendrophis pictus.**

Coluber pictus, Gmel. Syst. Nat. i, p. 1116 (1788).

Leptophis pictus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 930 (1847).

Dendrophis pictus, Günth. Rept. Brit. Ind. p. 297 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 337 (1890); id. Cat. Sn. ii, p. 78 (1893); S. Flower, P. Z. S. 1899, p. 669; Wall, Journ. Nat. Hist. Soc. Bombay, xix, p. 787, pl. xii (1910).

Eye as long as its distance from the nostril. Rostral much broader than deep; internasals as long as or a little shorter than the præfrontals; frontal $1\frac{1}{3}$ to $1\frac{2}{3}$ times as long as broad, as long as its distance from the rostral or the end of the snout, shorter than the parietals; loreal elongate (rarely absent); one præ- and two postoculars; temporals 2+2, rarely 1+1 or 1+2; 9 upper labials, fifth and sixth, or fourth, fifth, and sixth, entering the eye, rarely 7 or 8; 5, rarely 4, lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 15 rows, vertebrals nearly as large as outer. Ventrals 156–204; anal divided; subcaudals 119–164. Olive or bronze-brown above; a black stripe on each side of the head, passing through the eye, usually very strongly marked on the temple and extending to the nape, where it may widen or break up into spots, separated by diagonal bands of rich blue-green; a whitish or yellow lateral stripe, bordered below by a dark stripe along the limit between the lower row of scales and the ventral shields; lower parts white, yellowish, or greenish.

Total length 1180 millim.; tail 440.

India, Burma, Siam, Malay Peninsula and Archipelago. Not uncommon and generally distributed in the Malay Peninsula, living chiefly on bushes and trees. Capt. Flower observes that it is very gentle when handled, and occasionally eats frogs. It feeds also on lizards. Dr. Annandale says it is probably the most abundant snake in the cultivated parts of the Patani-States, where it is called "Ular lidi" (Coconut-palm snake), and is generally found among bushes, often at the edge of rice-fields. According to Major Wall (J. Nat. Hist. Soc. Bombay, xviii, 1907, p. 189), this snake is ovoviviparous.

155. *Dendrophis formosus*.

Boie, Isis, 1827, p. 542; Bouleng. Cat. Sn. ii, p. 84 (1894); S. Flower, P. Z. S. 1896, p. 883, and 1899, p. 670.

Eye very large, as long as its distance from the rostral or the anterior border of the nostril. Rostral twice as broad as deep; internasals a little longer than the præfrontals; frontal $1\frac{1}{3}$ to $1\frac{1}{2}$ times as long as broad, as long as its distance from the end of the snout, as long as the parietals; loreal elongate; 1 præ- and 2 to 4 (usually 3) postoculars; temporals 2+2; 9 upper labials (rarely 8), fifth and sixth or fourth, fifth, and sixth (rarely third, fourth, and fifth) entering the eye; 5 lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales in 15 rows, vertebrals considerably larger than the outer. Ventrals 174-205; anal divided; subcaudals 132-158. Olive, bronze-brown, or yellowish brown above, with red and green shades, scales edged with black, neck and sometimes top of head red-brown; a black stripe on each side of the head, passing through the eye and extending on to the nape, where it considerably widens and converges towards its fellow; two black lines may be present along each side of the posterior part of the body; upper lip greenish yellow; lower parts green.

Total length 1420 millim.; tail 480.

Malay Peninsula, Sumatra, Borneo, Java. Known from Penang, Prov. Wellesley, Selangor, Kelantan, Malacca, and Singapore, but not so common as the foregoing.

Genus *DENDRELAPHIS*.

Bouleng. Faun. Brit. Ind., Rept. p. 339 (1890).

Maxillary teeth 18 to 23; anterior maxillary and mandibular teeth longest. Head elongate, distinct from neck; eye large, with round pupil. Body much elongate, feebly compressed; scales smooth, in 13 (or 15) rows, narrow, disposed obliquely, with apical pits, those of the vertebral row not or but very slightly

enlarged; ventrals with a suture-like lateral keel and a notch on each side, corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals.

South-Eastern Asia and Papuasia.

A single species in the Malay Peninsula.

156. *Dendrelaphis caudolineatus*.

Ahetula caudolineata, Gray, Ill. Ind. Zool. ii, pl. lxxxii (1834).

Leptophis caudolineatus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 932 (1847).

Dendrophis caudolineatus, Günth. Rept. Brit. Ind. p. 297 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 339 (1890); id. Cat. Sn. ii, p. 89 (1894).

Eye nearly as long as snout. Rostral a little broader than deep; internasals as long as or a little shorter than the præfrontals; frontal $1\frac{1}{3}$ to $1\frac{2}{3}$ times as long as broad, longer than its distance from the end of the snout, a little shorter than the parietals; loreal elongate; one præ- and two postoculars; temporals 2+2; 9 upper labials, fifth and sixth (rarely fourth to sixth) entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 13 rows. Ventrals 171-188; anal divided; subcaudals 100-112. Light brownish bronze or greenish yellow above, the scales with black edges forming more or less regular longitudinal lines; a yellowish lateral streak, edged above and below by a black band, the lower of which extends to the outer edge of the ventrals; lips and lower parts pure metallic citrine, the tail with a black median line.

Total length 1520 millim.; tail 380.

Southern India, Mergui, Malay Peninsula and Archipelago. Recorded from Penang, Prov. Wellesley, Pahang, Perak, and Singapore, and almost the commonest snake in Selangor. Mr. Ridley remarks (Journ. Straits Branch Roy. Asiat. Soc. 1899, p. 198) that when annoyed it emits an appalling odour of carrion.

Genus **SIMOTES**.

Dum. & Bibr. Mém. Ac. Sc. xxiii, p. 472 (1853).

Maxillary teeth 8 to 12, posterior very strongly enlarged and compressed; mandibular teeth subequal. Head short, not distinct from neck; eye rather small, with round pupil; rostral shield large. Body cylindrical; scales smooth (or feebly keeled), in 13 to 21 rows, with or without apical pits; ventrals rounded or obtusely keeled laterally. Tail short or moderate; subcaudals in two rows.

South-Eastern Asia. Five species have been recorded from the Malay Peninsula.

Small terrestrial snakes, feeding chiefly on lizards and smaller snakes.

Synopsis of the Species.

- I. Scales in 19 or 21 rows; anal entire; two superposed anterior temporals.
 Frontal considerably longer than its distance from the end of the snout *S. purpurascens*, p. 148.
 Frontal as long as or a little longer than its distance from the end of the snout *S. cycchurus*, p. 149.
- II. Scales in 17 rows.
 Anal entire; two superposed anterior temporals; 6 upper labials *S. octolineatus*, p. 149.
 Anal entire; a single anterior temporal; 7 upper labials *S. signatus*, p. 150.
 Anal divided; a single anterior temporal; 7 or 8 upper labials *S. cruentatus*, p. 150.

157. *Simotes purpurascens*.

Xenodon purpurascens, Schleg. Phys. Serp. ii, p. 90, pl. iii, figs. 13 & 14 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 914 (1847).

Simotes labuanensis, Günth. Rept. Brit. Ind. p. 217 (1864).

Simotes trinotatus, Günth. op. cit. p. 219.

Simotes purpurascens, Bouleng. Cat. Sn. ii, p. 218 (1894); S. Flower, P. Z. S. 1899, p. 671.

Portion of rostral visible from above as long as its distance from the frontal; suture between the internasals as long as or longer than that between the præfrontals; frontal large, considerably longer than its distance from the end of the snout, as long as or longer than the parietals; loreal as long as deep; 1 or 2 præoculars, with 1 or 2 suboculars below; 2 or 3 postoculars; temporals 2+3 or 2+2; usually 8 upper labials, fourth and fifth entering the eye, or fourth excluded by the second subocular; 4 or 5 lower labials in contact with the anterior chin-shields, which are about twice as long as the posterior. Scales in 19 or 21 rows. Ventrals 160-210, angulate laterally; anal entire; subcaudals 40-60. Brown or deep purple above, with darker, black-edged sinuous transverse bands, or with yellowish black-edged cross-bars; a large arrow-headed dark brown marking on the occiput and nape, with the apex on the frontal and usually confluent with a dark-brown chevron-shaped transverse band passing through the eyes; a dark oblique temporal streak; belly yellowish or pinkish buff, with square blackish spots, which may be confined to the sides.

Total length 680 millim.; tail 110.

Southern China and Cochinheina to Malay Peninsula and Archipelago. Recorded from Penang, Prov. Wellesley, Kelantan, Pahang, Johore, and Singapore.

158. *Simotes cyclurus*.

Coronella cyclura, Cantor, P. Z. S. 1839, p. 50.

Simotes bicatenatus, Günth. Rept. Brit. Ind. p. 217 (1864).

Simotes fasciolatus, Günth. op. cit. p. 218, pl. xx, fig. B.

Simotes cochinchinensis, Günth. op. cit. p. 219, pl. xx, fig. C.

Simotes cyclurus, Bouleng. Faun. Brit. Ind., Rept. p. 311 (1890); id. Cat. Sn. ii, p. 219 (1894); S. Flower, P. Z. S. 1899, p. 671.

Portion of rostral visible from above nearly as long as its distance from the frontal; suture between the internasals as long as or shorter than that between the præfrontals; frontal as long as its distance from the end of the snout or a little longer, and as long as the parietals; loreal as long as deep, or a little deeper than long; præocular single, usually with a small subocular below it, between the third and fourth labials; 2 postoculars; temporals 2+2 (rarely 1+2); normally 8 upper labials, fourth and fifth entering the eye; 4, rarely 3, lower labials in contact with the anterior chin-shields; posterior chin-shields $\frac{1}{2}$ to $\frac{2}{3}$ the length of the anterior. Scales in 19 or 21 rows. Ventrals 156-210, angulate laterally; anal entire; subcaudals 36-58. Pale brown or greyish above, with or without four darker brown stripes, the median pair separated by the vertebral series of scales; antero-lateral border of some of the scales frequently black; markings on the head as in the preceding species; lower surfaces yellowish, uniform or with squarish brown spots on each side of the angle of the ventrals; these spots may be confluent or form two chain-like series.

Total length 700 millim.; tail 100.

Southern China and Bengal to Malay Peninsula and Sumatra. Stoliczka has recorded a specimen (*S. catenifer*) in a collection from Penang and Province Wellesley.

159. *Simotes octolineatus*.

Elaps octolineatus, Schneid. Hist. Amph. ii, p. 299 (1801).

Simotes octolineatus, Bouleng. Faun. Brit. Ind., Rept. p. 313 (1890);

id. Cat. Sn. ii, p. 224 (1894); S. Flower, P. Z. S. 1896, p. 884.

Portion of rostral visible from above a little shorter than its distance from the frontal; suture between the internasals nearly as long as that between the præfrontals; frontal longer than its distance from the end of the snout, as long as the parietals; loreal as long as deep; one præocular; two postoculars; temporals 2+2; 6 upper labials, third and fourth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 17 rows. Ventrals obtusely

angulate, 156-197; anal entire; subcaudals 43-61. Yellow or pale brown above, with 6 or 8 black longitudinal stripes, or blackish with yellow longitudinal lines, which are much narrower than the interspaces between them; head yellow, the two median black dorsal stripes meeting on the frontal; a black crescentic cross band anteriorly, passing through the eyes, and an oblique band on each side from the parietal shield to below the angle of the mouth; lower parts uniform yellow, or with a series of black spots on each side of the ventrals; sometimes confluent into a line.

Total length 680 millim.; tail 100.

Southern India, Malay Peninsula and Archipelago. Recorded from Perak and Singapore. The commonest of the genus in the Peninsula.

160. *Simotes signatus*.

Günth. Rept. Brit. Ind. p. 215, pl. xx, fig. F (1864); Bouleng. Cat. Sn. ii, p. 226 (1894).

Portion of rostral visible from above shorter than its distance from the frontal; suture between the internasals as long as or shorter than that between the præfrontals; frontal longer than its distance from the end of the snout, as long as the parietals; a small square loreal; one præ- and one postocular; temporals 1 + 2; 7 upper labials, third and fourth entering the eye; 3 or 4 lower labials in contact with the anterior chin-shields, which are a little shorter than the posterior. Scales in 17 rows. Ventrals 141-157; anal entire; subcaudals 47-59. Dark brown above, with yellowish cross-bands or transverse rhomboidal spots; the first two cross-bands chevron-shaped; head with dark brown symmetrical markings separated by yellowish interspaces; belly yellowish, with a lateral series of brown spots.

Total length 520 millim.; tail 130.

Singapore, Sumatra, Java.

161. *Simotes cruentatus*.

Günth. Ann. & Mag. Nat. Hist. (4) i, p. 417 (1868); Bouleng. Faun. Brit. Ind., Rept. p. 315 (1890); id. Cat. Sn. ii, p. 231 (1894).

Portion of rostral visible from above shorter than its distance from the frontal; suture between the internasals much shorter than that between the præfrontals; frontal as long as its distance from the end of the snout, slightly shorter than the parietals; loreal longer than deep; one præocular; two postoculars; temporals 1 + 2; 8 (rarely 7) upper labials, fourth and fifth (or third and fourth) entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are longer than the posterior. Scales in 17 rows. Ventrals 148-173; anal divided; subcaudals 27-37. Brown above, with four more or less distinct darker longitudinal lines; symmetrical dark markings on head broken up, rather indistinct in the adult, an oblique spot below the eye and a

large patch on the occiput being distinguishable; lower parts coral-red, with square black spots, at least on the posterior third of the belly; a large black spot at the base of the tail, and sometimes a second near the tip.

Total length 350 millim.; tail 45.

Burma. Stoliczka has mentioned a specimen in a collection received from Penang and Province Wellesley.

Genus **ABLABES.**

Dum. & Bibr. *Erp. Gén.* vii, p. 304 (1854).

Maxillary teeth small, equal, 15 to 30; mandibular teeth sub-equal. Head not or scarcely distinct from neck; eye rather small or moderate, with round pupil; loreal present or absent; nasal entire or divided. Body cylindrical, usually slender; scales smooth or feebly keeled, without apical pits, in 13 or 15 rows; ventrals rounded. Tail moderate or long; subcaudals in two rows.

South-Eastern Asia and Japan.

Three species in the Malay Peninsula:—

Nasal single; no loreal; scales in 15 rows; sub-caudals 103–137	<i>A. tricolor</i> , p. 151.
Nasal divided; loreal present; scales in 13 rows; subcaudals 58–75	<i>A. baliodirus</i> , p. 152
Nasal divided; loreal present or absent; scales in 13 rows; subcaudals 77–103	<i>A. longicauda</i> , p. 152.

162. **Ablabes tricolor.**

Herpetodryas tricolor, Schleg. *Phys. Serp.* ii, p. 187, pl. vi, figs. 16–18 (1837).

Ablabes tricolor, Bouleng. *Cat. Sn.* ii, p. 281 (1894); S. Flower, *P. Z. S.* 1899, p. 673.

Snout rather long and depressed, twice as long as eye; rostral broader than deep; nasal entire; no loreal, the præfrontal in contact with the second and third labials; frontal not broader than the supraocular, as long as its distance from the end of the snout, shorter than the parietals; one præ- and two postoculars; temporals 1 + 2; 8 upper labials, fourth and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are a little shorter than the posterior. Scales in 15 rows. Ventrals 140–187; anal divided; subcaudals 103–137. Olive or greenish above; a black streak on each side of the head and anterior part of the body, passing through the eye; upper lip and lower parts yellowish white; a pale olive streak along each side of the belly.

Total length 560 millim.; tail 220.

Malay Peninsula and Archipelago. Known from Penang, Kelantan, and Singapore, and met with in Perak.

163. *Ablabes baliodirus*.

Coronella baliodira, Boie, Isis, 1827, p. 539; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 913 (1847).

Ablabes baliodirus, Günth. Rept. Brit. Ind. p. 224 (1864); Bouleng. Cat. Sn. ii, p. 283 (1894); S. Flower, P. Z. S. 1899, p. 673.

Snout short; rostral broader than deep; nasal divided; a small loreal; frontal longer than its distance from the end of the snout, shorter than the parietals; one or two præ- and two postoculars; temporals 1 + 2; 7 upper labials, third and fourth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as or shorter than the posterior. Scales in 13 rows. Ventrals 115-137; anal divided; subcaudals 58-75. Brown above, usually with small black-edged yellow spots, sometimes with blackish cross-bands or two series of large alternating black blotches on the anterior part of the body, or with two light, dark-edged streaks along the body and a third on the nape; head sometimes yellowish; lips yellowish, with the sutures between the shields black; lower parts yellowish or coral-red, the brown of the upper parts usually descending to the sides of the ventrals, each of which may bear a black dot at the end; sometimes a black line along the middle of the lower surface of the tail.

Total length 400 millim.; tail 125.

Malay Peninsula and Archipelago. Obtained on Penang by Cantor, and in Province Wellesley by Capt. Flower. According to the latter, a specimen was caught by Mr. H. N. Ridley on the top of Bujong Malacca, in Perak.

164. *Ablabes longicauda*.

Peters, Mon. Berl. Ac. 1871, p. 574; Bouleng. Cat. Sn. ii, p. 284 (1894); S. Flower, P. Z. S. 1899, p. 673.

Snout short, little longer than eye; rostral broader than deep; nasal divided; a small loreal, sometimes confluent with the posterior nasal; frontal longer than its distance from the end of the snout, shorter than the parietals; one or two præ- and two postoculars; temporals 1 + 2; 8 (or 7) upper labials, third to fifth (or third and fourth) entering the eye; 4 lower labials in contact with the anterior chin-shields, which are slightly longer than the posterior. Scales in 13 rows. Ventrals 110-122; anal divided; subcaudals 77-103. Lustrous dark brown or black above, with three yellowish longitudinal lines lost on the hinder half of the body; the vertebral line beginning behind the nape, the laterals widening anteriorly and descending obliquely with their black borders towards the throat; a yellow chevron-shaped collar, pointing backwards; the black of the upper surface of the head descending as a triangular patch on the temple; eye bordered

with black; upper labials yellowish, with a few small black spots; lower parts uniform yellowish white.

Total length 430 millim.; tail 170.

Malay Peninsula, Sumatra, Borneo. Has been obtained in Penang and Kelantan.

Genus **MACROCALAMUS.**

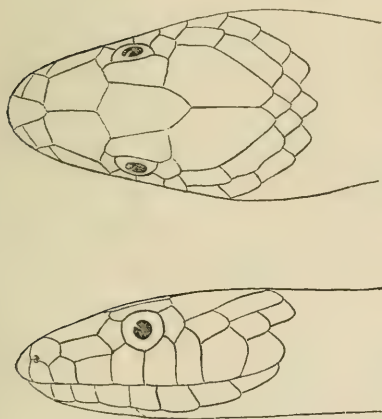
Günth. Rept. Brit. Ind. p. 198 (1864).

Maxillary teeth about 10, subequal; mandibular teeth subequal. Head not distinct from neck; eye small, with round pupil; nostril pierced between a nasal and the first upper labial; no internasals; loreal present or absent. Body cylindrical; scales smooth, without apical pits, in 15 rows; ventrals rounded. Tail short; subcaudals in two rows.

A single species.

165. **Macrocalamus lateralis.**

Günth. op. cit. p. 199, pl. xviii, fig. D; Bouleng. Cat. Sn. ii, p. 327 (1894); S. Flower, P. Z. S. 1899, p. 673.



Rostral deeper than broad, extending to the upper surface of the head, separating the nasals; frontal longer than broad, a little longer than its distance from the end of the snout, a little shorter than the parietals; loreal usually present; one præ- and one post-ocular; temporals 1 + 2; 8 upper labials, fourth and fifth entering the eye; 4 lower labials in contact with the anterior chin-shields; posterior chin-shields small. Scales in 15 rows. Ventrals 110-127; anal entire; subcaudals 19-27. Rich dark reddish brown above; below,

Fig. 47.—Head of *Macrocalamus lateralis*.

head and neck yellow, remainder bright coral-red, with a black lateral line; labials and sides of neck yellow.

Total length 300 millim.; tail 32.

The locality of the type specimen is unknown. Capt. Flower and Mr. A. L. Butler obtained specimens in the Larut Hills, Perak, at an elevation of 3500 to 4500 feet.

Genus **PSEUDORHABDIUM**.

Jan, Arch. Zool. Anat. Phys. ii, p. 10 (1862).

Maxillary teeth 10 to 12, subequal; anterior mandibular teeth slightly longer than the posterior. Head not distinct from neck; eye small, with round pupil; nostril pierced in a minute nasal; internasals small; no loreal; præocular small or absent; no temporals, the parietals in contact with the labials. Body cylindrical; scales smooth, without apical pits, in 15 rows; ventrals rounded. Tail short; subcaudals in two rows.

Malay Peninsula and Archipelago. Two species, the second confined to the Philippine Islands.

166. **Pseudorhabdium longiceps**.

Calamaria longiceps, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 210, pl. —, fig. 1 (1847).

Oxycalamus longiceps, Günth. Rept. Brit. Ind. p. 199 (1864).

Pseudorhabdium longiceps, Bouleng. Cat. Sn. ii, p. 329 (1894).

Snout rather pointed; rostral small, as deep as broad, well visible from above; frontal a little longer than broad, as long as or a little shorter than its distance from the end of the snout, shorter than the parietals, more than twice as broad as the supraocular; 1 postocular; 5 upper labials, third and fourth entering the eye; symphyseal in contact with the anterior chin-shields, which are about twice as large as the posterior. Scales in 15 rows. Ventrals 129–146; anal entire; subcaudals 10–28. Tail pointed. Irides brown or black, with or without a yellowish collar; usually a yellowish vertical spot above the angle of the mouth.

Total length 230 millim.; tail 35.

Malay Peninsula: Penang, Perak, Pahang (Gunong Tahan), Selangor, Singapore; Sumatra, Borneo, Philippines, Celebes.

Fairly common in Selangor, where it is found in damp situations among dead leaves.

Genus **CALAMARIA**.

Boie, in Férussac, Bull. Sc. Nat. ix, p. 236 (1826).

Maxillary teeth 8 to 11, subequal; anterior mandibular teeth a little longer than the posterior. Head not distinct from neck; eye small, with round pupil; nostril pierced in a minute nasal; no loreal; no internasals; no temporals, the parietals in contact with the labials. Body cylindrical; scales smooth, without apical pits, in 13 rows; ventrals rounded. Tail short; subcaudals in two rows.

From Assam, Burma, and Southern China to the Malay Archipelago. Five species have been recorded from the Malay Peninsula.

Small, dwarfed snakes of very/gentle habits, found on the ground, especially beneath stones, fallen trees, or turf; feeding chiefly on insects and worms.

Synopsis of the Species.

I. 5 or 6 upper labials, third and fourth entering the eye.

A. Frontal not twice as broad as the supraocular.

Frontal shorter than the parietals: ventrals 147-210

C. vermiformis, p. 155.

Frontal as long as the parietals; ventrals 143-167

C. albiventer, p. 156.

B. Frontal more than twice as broad as the supraocular.

Frontal longer than broad; symphysial in contact with the chin-shields

C. sumatrana, p. 156.

Frontal as broad as long; first lower labial in contact with its fellow behind the symphysial

C. leucocephala, p. 157.

II. 4 upper labials, second and third entering the eye

C. pavimentata, p. 157.

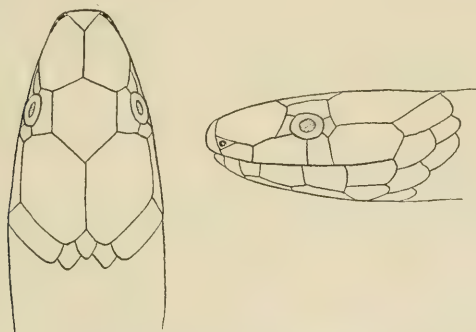


Fig. 48.—Head of *Calamaria pavimentata*.

167. *Calamaria vermiformis*.

Dum. & Bibr. Erp. Gén. vii, p. 85 (1854); Bouleng. Cat. Sn. ii, p. 333 (1894).

Rostral a little broader than deep; frontal longer than broad, not twice as broad as the supraocular, shorter than the parietals; a præ- and a postocular; diameter of eye equal to its distance from the mouth; 5 or 6 upper labials, third and fourth entering the eye; symphysial in contact with the anterior chin-shields. 13 rows of scales. Ventrals 147-210; anal entire; subcaudals 15-26. Tail

ending in a point. Dark brown or black above; head often yellow, entirely or partially; body sometimes with yellowish cross-bars or transverse series of spots; yellowish beneath, with or without large black transverse spots or cross-bands.

Total length 410 millim.; tail 33.

Perak (4000 feet) and Malay Archipelago.

168. *Calamaria albiventer*.

Changulia albiventer, Gray, Ill. Ind. Zool. ii, pl. lxxxvi, fig. 3 (1834).

Calamaria linnæi, var., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 909 (1847).

Calamaria albiventer, Günth. Rept. Brit. Ind. p. 197 (1864); Bouleng. Cat. Sn. ii, p. 336 (1894); S. Flower, P. Z. S. 1899, p. 674.

Rostral nearly as deep as broad; frontal once and a half as long as broad, not twice as broad as the supraocular, as long as the parietals; a præ- and a postocular; diameter of eye equal to its distance from the mouth; 5 upper labials, third and fourth entering the eye; symphyseal in contact with the anterior chin-shields. 13 rows of scales. Ventrals 143-167; anal entire; subcaudals 16-21. Tail ending in a point. Red-brown above, with a pair of black-edged bright red vertebral lines and a bluish-white, black-edged line on each side; lower parts red (carmine or coral-red), yellow under the head; a black line along the middle of the tail.

Total length 390 millim.; tail 20.

Known from Penang and Province Wellesley.

169. *Calamaria sumatrana*.

Edeling, Nat. Tijdschr. Nederl. Ind. xxxi, p. 379 (1870); W. L. Slater, Journ. Asiat. Soc. Bengal, lx, p. 233 (1891); Bouleng. Cat. Sn. ii, p. 339 (1894).

Rostral a little broader than deep; frontal longer than broad, rather more than twice as broad as the supraocular, a little shorter than the parietals; a præ- and a postocular; diameter of eye equal to its distance from the mouth; 5 upper labials, third and fourth entering the eye; symphyseal in contact with the anterior chin-shields. 13 rows of scales. Ventrals 129-176; anal entire; subcaudals 12-31. Tail ending in a point. Reddish brown or dark brown above, with five black longitudinal lines or series of small black spots; each scale of the outer row with a white spot; a more or less distinct yellow collar on the nape, continuous or narrowly interrupted in the middle; sometimes a similar marking at the base of the tail; lower parts uniform yellowish, with a more or less distinct black line along the middle of the tail.

Total length 265 millim.; tail 12.

Singapore and Sumatra.

170. *Calamaria leucocephala*.

Dum. & Bibr. Erp. Gén. vii, p. 83 (1854); Günth. Rept. Brit. Ind. p. 198 (1864); Bouleng. Cat. Sn. ii, p. 344 (1894); S. Flower, P. Z. S. 1899, p. 674.

Calamaria lunbricoïdea, var., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 908 (1847).

Calamaria nigro-alba, Günth. l. c. pl. xviii, fig. C.

Rostral much broader than deep; frontal at least as broad as long, four times as broad as the supraocular, shorter than the parietals; a præ- and a postocular; diameter of eye much less than its distance from the mouth; 5 upper labials, third and fourth entering the eye; first lower labial in contact with its fellow behind the symphysial. 13 rows of scales. Ventrals 136–171; anal entire; subcaudals 19–45. Tail ending in a point. Dark brown or black above, highly iridescent; head sometimes yellow, with or without dark brown markings; lower parts white, buff, or very pale purplish blue; a faint brown subcaudal line may be present.

Total length 450 millim.; tail 48.

Malay Peninsula (Penang, Selangor, Singapore), Sumatra, Borneo, Java.

171. *Calamaria pavimentata*.

Dum. & Bibr. Erp. Gén. vii, p. 71 (1854); Bouleng. Faun. Brit. Ind., Rept. p. 282 (1890); id. Cat. Sn. ii, p. 348 (1894); S. Flower, P. Z. S. 1896, p. 886, and 1899, p. 675.

Calamaria quadrimaculata, Dum. & Bibr. t. c. p. 73; Günth. Rept. Brit. Ind. p. 197 (1864).

Calamaria siamensis, Günth. op. cit. p. 196.

Rostral as deep as broad; frontal longer than broad, twice and a half as broad as the supraocular, shorter than the parietals; a præ- and a postocular; the diameter of the eye nearly equals its distance from the mouth; 4 upper labials, second and third entering the eye; first lower labial in contact with its fellow behind the symphysial. 13 rows of scales. Ventrals 133–182; anal entire; subcaudals 9–27. Tail pointed. Reddish brown above, with five dark longitudinal lines or series of spots; nape dark brown, separated from the back by a yellow collar; a pair of yellow spots on the base and another at the end of the tail.

Total length 320 millim.; tail 15.

Southern China to Malay Archipelago (Penang, Prov. Wellesley, Perak, Pahang), Java.

Subfamily HOMALOPSINÆ.

Synopsis of the Genera.

I. Nasals in contact above the rostral.

- Scales smooth; parietal shields well developed. *HYPsirrhina*, p. 158.
 Scales keeled; parietals well developed *HOMalopsis*, p. 162.
 Scales keeled; parietals more or less broken up
 into scales. *CERBERUS*, p. 163.

II. Nasals separated by an internasal; scales smooth.

- Loreal absent; parietals well developed; body
 stout; ventrals large, not keeled *FORDONIA*, p. 164.
 Loreal present; parietals well developed; body
 extremely elongate; ventrals large, not keeled. *CANTORIA*, p. 165.
 Loreal present; parietals broken up into scales;
 ventrals very narrow, bicarinate *HIPISTES*, p. 166.

The snakes of this subfamily are thoroughly aquatic and viviparous.

Genus *HYPsirrhina*.

Wagl. Syst. Amph. p. 169 (1830).

Maxillary teeth 10-16, followed, after an interspace, by a pair of enlarged, grooved fangs; anterior mandibular teeth longest. Head small, not or but slightly distinct from neck; eye small, with round or vertically elliptic pupil; head-shields large; nasals in contact behind the rostral, semidivided, the cleft extending from the nostril to the first labial or the loreal; internasal single or divided; loreal present. Body cylindrical; scales smooth, without pits, in 19 to 33 rows; ventrals rounded. Tail moderate or short; subcaudals in two rows.

South-Eastern Asia, Papuasias, Northern Australia.

Five species have been found in the Malay Peninsula.

Synopsis of the Species.

I. Scales in 19 rows.

- Ventrals 173-175; two internasals *H. indica*, p. 159.
 Ventrals 117-139; a single nasal (rarely divided). *H. plumbea*, p. 160.

II. Scales in 21 rows or more.

- Scales in 21 or 23 rows; a single internasal . . . *H. enhydis*, p. 160.
 Scales in 27 rows; a single internasal. *H. bocourti*, p. 161.
 Scales in 29-33 rows; two internasals *H. sieboldii*, p. 161.

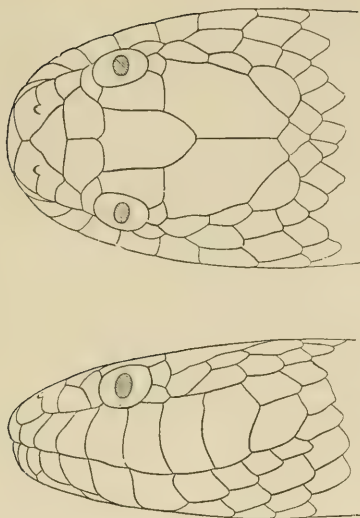


Fig. 49.—Head of *Hypsirhina plumbea*.

172. *Hypsirhina indica*.

Racilitia indica, Gray, Zool. Misc. p. 67 (1842).

Hypsirhina indica, Bouleng. Cat. Sn. iii, p. 4, pl. i, fig. 1 (1896).

Rostral broader than deep; internasals distinct; frontal as broad as or narrower than the supraocular (which appears to have fused with an upper postocular), little longer than broad, as long as its distance from the rostral or the end of the snout, shorter than the parietals; loreal longer than deep, in contact with the internasal; one præ- and one postocular; temporals 1 + 2; 8 upper labials, fourth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are longer than the posterior; the latter separated from each other by scales. Scales in 19 rows. Ventrals 173–175; anal divided; subcaudals 28–34. Dark purplish brown above, with a few interrupted, yellowish, transverse lines on the occiput and anterior part of the body; sides with yellowish (red?) vertical bars; belly yellowish (red?), spotted with black.

Total length 345 millim.; tail 40.

The only known specimens, the types in the British Museum, are supposed to be from the Malay Peninsula.

173. *Hypsirhina plumbea*.

Homalopsis plumbea, Boie, Isis, 1827, p. 560; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 948 (1847).

Hypsirhina plumbea, Gray, Zool. Misc. p. 66 (1842); Günth. Rept. Brit. Ind. p. 280 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 376, fig. (1890); id. Cat. Sn. iii, p. 5 (1896); S. Flower, P. Z. S. 1899, p. 675.

Rostral much broader than deep; internasal single (rarely divided), broader than long; frontal once and half to once and two thirds as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal as long as deep or deeper than long; one præ- and two postoculars; temporals 1 + 2; 8 upper labials, fourth or fourth and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are larger than the posterior; latter separated by scales. Scales in 19 rows. Ventrals 117-139; anal divided; subcaudals 29-46. Brownish or greyish olive above, uniform or with a vertebral series of small black spots; upper lip and lower parts white, usually with a blackish line along the middle of the tail; belly sometimes with some blackish spots, or with a median series of blackish dots.

Total length 485 millim.; tail 65.

Burma, Southern China, Indo-China, Malay Peninsula and Archipelago. Recorded from Penang, Perak, Patani States, and Kedah.

According to Capt. Flower, this snake, when frightened, will bite fiercely at anything within reach.

174. *Hypsirhina enhydris*.

Hydrus enhydris, Schneid. Hist. Amph. i, p. 245 (1799).

Homalopsis enhydris, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 946 (1847).

Hypsirhina enhydris, Günth. Rept. Brit. Ind. p. 281, pl. xxii, fig. K; Bouleng. Faun. Brit. Ind., Rept. p. 376 (1890); id. Cat. Sn. iii, p. 6 (1896); S. Flower, P. Z. S. 1899, p. 676.

Rostral twice as broad as deep; internasal single, nearly twice as broad as long; frontal nearly twice as long as broad, as long as or shorter than its distance from the end of the snout, as long as the parietals; loreal as long as deep or a little longer than deep, in contact with the internasal; one præ- and two (rarely one) postoculars; temporals 1 + 2; 8 upper labials, fourth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are shorter than the posterior; latter widely separated from each other. Scales in 21 rows, rarely 23. Ventrals 150-177; anal divided; subcaudals 47-48. Dark grey, brown, or olive above, with two more or less distinct light longitudinal bands; lower parts pale yellow, with a blackish line along each side of the ventrals and usually a median blackish line or series of dots.

Total length 680 millim.; tail 135.

India, Ceylon, Southern China and Burma to Malay Peninsula and Archipelago. Recorded from Penang, Kedah, and Singapore.

175. *Hypsirhina bocourti*.

Jan. Arch. Zool. Anat. Phys. iii, p. 258 (1865); Bouleng. Cat. Sn. iii, p. 10 (1896); S. Flower, P. Z. S. 1899, p. 676.

Rostral broader than deep; a single internasal, about twice as broad as long; frontal narrow, narrower than the supraocular, at least twice as long as broad, as long as its distance from the end of the snout, a little shorter than the parietals; loreal a little longer than deep; one præ- and two postoculars; temporals 1 + 2; 8 upper labials, fourth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are very large; posterior chin-shields very small and separated from each other by scales. Scales in 27 rows. Ventrals 126-135; anal divided; subcaudals 33-48. Pale olive-brown above, with blackish cross-bands separated by narrow interspaces, or dark olive-brown with dark yellow spots forming longitudinal lines and more or less irregular dark yellow, narrow cross-bars; upper lip, sides, and belly yellow; the labial shields black-edged.

Total length 1120 millim.; tail 150.

Siam and Malay Peninsula. This snake was discovered in the Malay Peninsula by Capt. Flower, who obtained an adult female near Alor Stah, Kedah. While in captivity she gave birth to 17 young, about 220 millim. long. When only a day or two old they fed freely on small frogs. Specimens were also obtained at Jalor by Messrs. Annandale and Robinson.

176. *Hypsirhina sieboldii*.

Homalopsis sieboldii, Schleg. Phys. Serp. ii, p. 349, pl. xiii, figs. 4 & 5 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 945 (1847).

Ferania sieboldii, Günth. Rept. Brit. Ind. p. 284 (1864).

Hypsirhina sieboldii, Bouleng. Faun. Brit. Ind., Rept. p. 377 (1890); id. Cat. Sn. iii, p. 11 (1896).

Rostral nearly as deep as broad; two internasals; frontal broader than the supraocular, as long as its distance from the end of the snout, as long as the parietals; loreal as long as deep or a little deeper than long; one præocular, sometimes with a small subocular below it; two postoculars; temporals 1 + 2; 7 or 8 upper labials, fourth entering the eye; 4 lower labials in contact with the anterior chin-shields; posterior chin-shields very small. Scales in 29-33 rows. Ventrals 147-156; anal divided; subcaudals 48-56. Whitish or pale brown above, with dark brown black-edged elliptical or rhomboidal transverse spots broader than their interspaces; a series of round spots on each side, alternating with the dorsal spots; head with three dark brown longitudinal bands, confluent between the eyes; lower parts white, checkered with black.

Total length 600 millim.; tail 120.

India and Burma. Cantor obtained a single specimen in Province Wellesley.

Genus **HOMALOPSIS.**

Kuhl, Isis, 1822, p. 474.

Maxillary teeth 11-13, decreasing in length posteriorly, followed, after an interspace, by a pair of slightly enlarged, grooved teeth; anterior mandibular teeth much longer than the posterior. Head distinct from neck; eye small, with vertically elliptic pupil; head-shields large; nasals in contact behind the rostral, semi-divided, the cleft extending from the nostril to the first labial; internasal single or divided; loreal present. Body cylindrical; scales distinctly striated and keeled, without pits, in 37 to 47 rows; ventrals well developed, not keeled. Tail moderate; sub-caudals in two rows.

A single species.

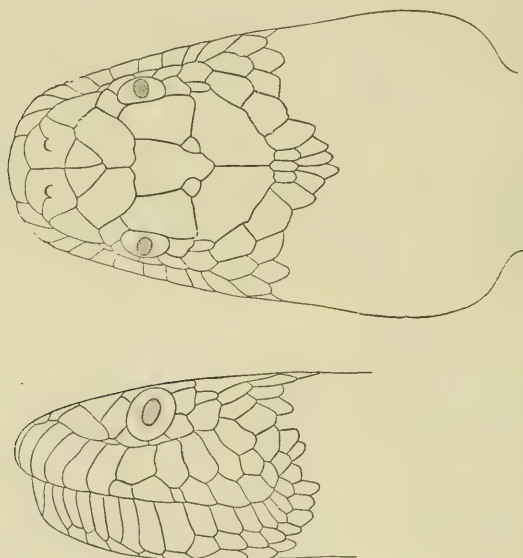


Fig. 50.—Head of *Homalopsis buccata*.

177. **Homalopsis buccata.**

Coluber buccatus, Linn. Syst. Nat. i, p. 377 (1766).

Homalopsis buccata, Schleg. Phys. Serp. ii, p. 337, pl. xiii, figs. 1-3 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 943 (1847); Günth. Rept. Brit. Ind. p. 285 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 374 (1890); id. Cat. Sn. iii, p. 14 (1896); S. Flower, P. Z. S. 1899, p. 677.

Frontal often broken up into several shields, not much broader, sometimes even narrower than the supraocular; parietals short; loreal sometimes divided into two; 1 or 2 præ- and 2 postoculars; 1 to 3 suboculars sometimes present; temporals small, scale-like;

10 to 12 upper labials, fifth or sixth entering the eye, or narrowly separated from it by suboculars; 2 or 3 pairs of chin-shields in a transverse row, inner in contact with 3 first lower labials. Scales in 37-47 rows. Ventrals 158-176; anal divided; subcaudals 70-106. Above with broad transverse dark brown, black-edged cross-bands separated by narrow pale brown interspaces, which are yellow in the young; head pale, with a triangular or V-shaped dark brown mark on the snout, a Λ -shaped mark on the vertex, and a dark brown band on each side, beginning in front of and passing through the eye; belly white, shading to yellow on the sides, which bear a series of black spots; lower surface of tail spotted with dark brown.

Total length 1050 millim.; tail 230.

Cochinchina, Burma, Siam, Malay Peninsula and Archipelago.

Generally distributed in the Malay Peninsula, where it is found in or near water, feeding on fish and frogs. Captain Flower says that this snake when first caught is very wild, but becomes quite tame in a few days, shows more intelligence than most snakes and appreciates being petted.

Genus CERBERUS.

Cuvier, Règne Anim. 2nd ed. ii, p. 81 (1829).

Maxillary teeth 12-17, followed, after a very short interspace, by a pair of slightly enlarged, grooved teeth; anterior mandibular teeth longest. Head small, not very distinct from neck; eye small, with vertically elliptic pupil; snout covered with shields; parietal shields more or less broken up into scales; nasals in contact behind the rostral, semidivided, the cleft extending from the nostril to the first or second labial; two internasals (rarely united); loreal present. Body cylindrical; scales striated and keeled, without pits, in 23 to 29 rows; ventrals well developed, not keeled. Tail moderate, slightly compressed; subcaudals in two rows.

South-Eastern Asia and North Australia. A single species in the Malay Peninsula.

178. *Cerberus rhynchops*.

Hydrus rhynchops, Schneid. Hist. Amph. i, p. 246 (1799).

Homalopsis rhynchops, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 941 (1847).

Cerberus rhynchops, Günth. Rept. Brit. Ind. p. 279 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 375 (1890); id. Cat. Sn. iii, p. 16 (1896).

Frontal distinct or broken up into small shields; loreal usually in contact with the 3 or 4 anterior labials and with the internasal; eye between 4 to 6 shields, separated from the labials by suboculars; 9 or 10 upper labials; 4 lower labials in contact with the anterior chin-shields; posterior chin-shields smaller and wedged

in between the anterior and the labials. Scales very strongly keeled, in 23 or 25 (rarely 27) rows. Ventrals 122–160; anal divided; subcaudals 49–72. Grey, brown, olive, or blackish above, with more or less distinct black spots or cross-bars; a black streak on each side of the head, passing through the eye; a more or less distinct white or yellow lateral band; beneath whitish or yellowish, spotted or barred with black, or almost entirely black.

Total length 980 millim.; tail 180.

India and Ceylon, Burma, Indo-China, Siam, Malay Peninsula and Archipelago, Pelew Islands.

Generally distributed in the Malay Peninsula, where it occurs in rivers, estuaries and sea-coasts. It feeds on fish.

Genus **FORDONIA**.

Gray, Zool. Miscell. p. 67 (1842).

Maxillary teeth small, 7 or 8, followed by a pair of enlarged grooved teeth; mandibular teeth subequal. Head small, not distinct from neck; eye very small, with vertically elliptic pupil; head-shields large; nostril in an undivided or semidivided nasal; a single internasal, separating the nasals; no loreal. Body cylindrical; scales smooth, without pits, in 25 to 29 rows; ventrals well developed, not keeled. Tail short; subcaudals in two rows.

A single species.

179. *Fordonia leucobalia*.

Homalopsis leucobalia, Schleg. Phys. Serp. ii, p. 345, pl. xiii, figs. 8 & 9 (1837); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 949, pl. xl, fig. 5 (1847).

Fordonia unicolor, Gray, Cat. Sn. p. 77 (1849); Günth. Rept. Brit. Ind. p. 277 (1864).

Fordonia leucobalia, Bouleng. Faun. Brit. Ind., Rept. p. 378 (1890); id. Cat. Sn. iii, p. 21 (1896).

Frontal a little longer than broad, longer than its distance from the end of the snout, a little shorter than the parietals; one præ- and two postoculars; temporals 1 + 3 or 2 + 3; 5 upper labials, third entering the eye; 3 lower labials in contact with the anterior chin-shields, which are small and a little larger than the posterior. Scales in 25 to 29 rows. Ventrals 130–156, last frequently divided; anal divided; subcaudals 26–43. Brown, yellow, or red above, spotted or marbled with black, or black with or without small yellowish white spots; lower parts uniform yellowish white.

Total length 930 millim.; tail 110.

Rivers and coasts of Bengal, Burma, Cochin-China, Malay Peninsula and Archipelago, New Guinea, and North Australia.

At Penang, Cantor says, it is numerous not only in fresh water and estuaries, but in the sea at some distance from the shore, where it is sometimes taken in fishing nets. It is of sluggish, not fierce habits, and feeds on fishes and crustaceans. It is also recorded from Singapore.

Genus CANTORIA.

Girard, Proc. Ac. Philad. 1857, p. 182.

Maxillary teeth 10 or 11, last longest and grooved; anterior mandibular teeth longest. Head small, not distinct from neck; eye very small, with round pupil; head-shields large; nostril in a semidivided nasal, the cleft of which extends to the præfrontal; a single internasal, separating the nasals; loreal present. Body extremely elongate, slightly compressed; scales smooth, without pits, in 19 rows; ventrals well developed, not keeled. Tail moderate; subcaudals in two rows.

A single species.

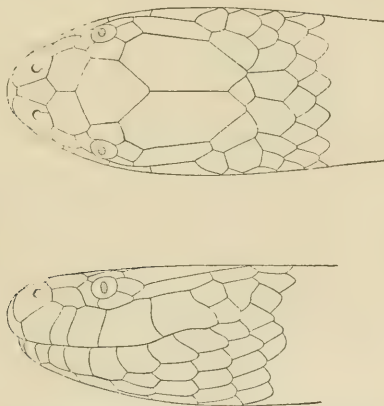


Fig. 51.—Head of *Cantoria violacea*.

180. *Cantoria violacea*.

Girard, l. c. and U. S. Explor. Exped., Herp. p. 156, pl. xi, figs. 7-10 (1858); Bouleng. Faun. Brit. Ind., Rept. p. 380 (1890); id. Cat. Sn. iii, p. 23 (1896); S. Flower, P. Z. S. 1899, p. 679.
Cantoria elongata, Günth. Rept. Brit. Ind. p. 277 (1864).

Frontal a little longer than broad, shorter than its distance from the end of the snout or than the parietals; eye between 4 shields—a præocular, a supraocular, a postocular, and a subocular; loreal longer than deep; one elongate anterior temporal; 5 upper

labials; 3 lower labials in contact with the anterior chin-shields, which are not longer than the posterior. Scales in 19 rows. Ventrals 260-284; anal divided; subcaudals 52-64. Blackish above, with white transverse bands which widen towards the abdomen; some white spots on the head; lower parts white, with greyish spots, the continuation of the dorsal bands; these bands may form complete rings on the tail.

Total length 1220 millim.

Mouth of the Moulmein River, Burma; Prov. Wellesley, Selangor, Singapore; Borneo.

A very rare snake, only a few specimens being preserved in Museums.

Genus **HIPISTES**.

Gray, Cat. Sn. p. 77 (1849).

Maxillary teeth 8 or 9, followed, after a short interspace, by a pair of slightly enlarged grooved teeth. Head small, not distinct from neck; eye minute, with vertically elliptic pupil; head-shields

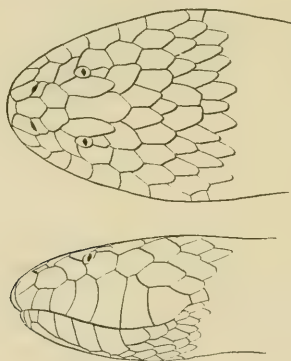


Fig. 52.—Head of *Hipistes hydrinus*.

small, parietals broken up into numerous shields; nostril a transverse slit between two nasals; a single internasal, separating the nasals; a loreal. Body elongate, slightly compressed; scales smooth, without pits, juxtaposed or subimbricate, in 35 to 43 rows; ventrals narrow, with two sharp keels. Tail short, feebly compressed; subcaudals in two rows.

A single species.

181. *Hipistes hydrinus*.

Homalopsis hydrina, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 951, pl. xl, fig. 4 (1847).

Hipistes hydrinus, Günth. Rept. Brit. Ind. p. 287, pl. xxiv, fig. H (1864); Bouleng. Faun. Brit. Ind., Rept. p. 382 (1890); id. Cat. Sn. iii, p. 24 (1896).

Frontal narrow, twice as long as broad, as long as or a little longer than its distance from the end of the snout; eye between 4 shields—a supraocular, a præocular, a subocular, and a small postocular; 7 upper labials; 5 lower labials in contact with the anterior chin-shields; posterior chin-shields extremely small. Scales in 35 to 43 rows. Ventrals 153–172; anal divided; subcaudals 21–35. Pale grey or brownish above, with black cross-bands, as broad as the interspaces between them or narrower; lower parts white.

Total length 485 millim.; tail 50.

Mouth of rivers and coasts of Pegu, Siam, and the Malay Peninsula.

The most Hydrophid-like of the *Homalopsinæ*. The specimens described by Cantor were captured in fishing-stakes placed in the sea off the shores of Kedah, or washed on shore by the waves on the coast of Penang. It is also on record from the coast of Selangor and from Singapore. It lives almost entirely upon fish.

Subfamily DIPSADOMORPHINÆ.

Synopsis of the Genera.

- | | |
|---|-------------------------|
| Pupil vertical; body more or less compressed; vertebral scales enlarged; maxillary teeth subequal..... | DIPSADOMORPHUS, p. 167. |
| Pupil vertical, or vertically subelliptic; body cylindrical; vertebral scales not enlarged; third and fourth maxillary teeth much enlarged, fang-like | PSAMMODYNASTES, p. 172. |
| Pupil horizontal; body compressed, very slender; vertebral scales slightly enlarged; one or two middle maxillary teeth much enlarged, fang-like | DRYOPHIS, p. 174. |
| Pupil horizontal; body compressed, slender; vertebral scales not enlarged; maxillary teeth subequal | DRYOPHIOPS, p. 176. |
| Pupil round; ventrals and subcaudals with a suture-like lateral keel and a notch on each side corresponding to the keel | CHRYSOPELEA, p. 176. |

Genus DIPSADOMORPHUS.

Fitzing. in Tschudi, Faun. Per., Herp. p. 55 (1845).

Maxillary teeth 10 to 14, subequal in size, followed by two or three enlarged, grooved fangs; anterior mandibular teeth longest.

Head very distinct from neck; eye moderate or large, with vertically elliptic pupil; posterior nasal more or less deeply concave. Body more or less compressed; scales smooth, more or less oblique, with apical pits, in 17-25 (31) rows, the vertebral row more or less enlarged; ventrals obtusely angulate laterally. Tail moderate or long; subcaudals in two rows.

Tropical Africa, Southern Asia, Papuasia, Australia.

Seven species in the Malay Peninsula. Arboreal and nocturnal.

Synopsis of the Species.

I. Scales in 19 or 21 rows.

A. Subcaudals 80-110; snout longer than eye.

Scales in 19 rows; præocular not extending to upper surface of head *D. multimaculatus*, p. 168.

Scales in 21 rows; præocular not extending to upper surface of head *D. gokool*, p. 169.

Scales in 21 rows; præocular extending to upper surface of head *D. dendrophilus*, p. 169.

B. Subcaudals 114-166.

Scales in 21 rows; snout not longer than eye *D. jaspideus*, p. 170.

Scales in 19 rows; snout not longer than eye *D. drapiezii*, p. 171.

Scales in 21 rows; snout longer than eye. . . *D. nigriceps*, p. 171.

II. Scales in 23 or 25 rows; subcaudals

114-159 *D. cynodon*, p. 172.

182. *Dipsadomorphus multimaculatus*.

Dipsas multimaculata, Boie, Isis, 1827, p. 549; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 923 (1847); Günth. Rept. Brit. Ind. p. 311 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 360 (1890).

Dipsadomorphus multimaculatus, Bouleng. Cat. Sn. iii, p. 63 (1896).

Anterior palatine teeth scarcely larger than the posterior; anterior mandibular teeth moderately enlarged. Snout longer than eye. Rostral broader than deep; frontal as long as broad or a little longer than broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep or deeper than long; one præocular, not extending to the upper surface of the head; 2 postoculars; temporals 2+2 or 2+3 (rarely 1+2); 8 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as or a little shorter than the posterior. Scales in 19 (rarely 17) rows, vertebral row strongly enlarged. Ventrals 202-235; anal entire; subcaudals 80-106. Grey-brown above, with two alternating series of

roundish dark brown spots and two other series of smaller spots lower down on the sides; two blackish bands on the head, diverging posteriorly; a blackish streak from the eye to the angle of the mouth; lower parts whitish, marbled or spotted with brown, and with a series of brown spots along each side.

Total length 750 millim.; tail 165.

Southern China to the Malay Peninsula and Archipelago. Obtained by Cantor in the hills of Penang.

183. *Dipsadomorphus gokool*.

Dipsas gokool, Gray, Ill. Ind. Zool. ii, pl. xxxiii, fig. 1 (1834);

Günth. Rept. Brit. Ind. p. 313 (1864); Bouleng. Faun. Brit.

Ind., Rept. p. 360 (1890).

Dipsas cynodon, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 924 (1847).

Dipsadomorphus gokool, Bouleng. Cat. Sn. iii, p. 64 (1896).

Anterior palatine teeth scarcely larger than the posterior; anterior mandibular teeth feebly enlarged. Snout longer than eye. Rostral a little broader than deep; frontal as long as broad or slightly longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal as long as deep or deeper than long; 1 or 2 preoculars, not extending to the upper surface of the head; 2 postoculars; temporals 2+3; 8 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields; posterior chin-shields as long as the anterior and in contact with each other. Scales in 21 rows, the vertebral row strongly enlarged. Ventrals 224-225; anal entire; subcaudals 87-94. Yellowish brown above; head with an arrow-headed brown, black-edged marking, longitudinally bisected; a black streak on each side of the head, passing through the eye; a yellowish vertebral streak; a series of erect Y-shaped markings on each side of the back; lower parts yellowish, with a series of brown spots along each side.

Total length 830 millim.; tail 170.

Bengal, Assam, Penang.

184. *Dipsadomorphus dendrophilus*.

Dipsas dendrophilus, Boie, Isis, 1827, p. 549; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 923 (1847); Günth. Rept. Brit. Ind. p. 310 (1864).

Dipsadomorphus dendrophilus, Bouleng. Cat. Sn. iii, p. 70 (1896); S. Flower, P. Z. S. 1899, p. 680; Ridley, Journ. Str. Br. Asiat. Soc. 1899, p. 199.

Malay names. *Ular ringkup* and *ular chin-chin mas*; *ular punti*; *ular tiyong*.

Anterior palatine teeth scarcely longer than the posterior; anterior mandibular teeth moderately enlarged. Snout longer

than eye. Rostral a little broader than deep; frontal as long as broad or a little longer than broad, as long as or a little shorter than its distance from the end of the snout, shorter than the parietals; loreal as long as deep or a little longer than deep; one præocular, extending to the upper surface of the head but not reaching the frontal; 2 postoculars; temporals 2+2 or 2+3; 8 (exceptionally 9) upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are as long as or a little longer than the posterior. Scales in 21 (rarely 23) rows, vertebral row more or less strongly enlarged. Ventrals 209-239; anal entire; subcaudals 89-110. Black above with yellow cross-bars, which are continuous across the back or are restricted to the sides; labials yellow, edged with black; throat and sometimes anterior part of belly yellow, the rest of the lower parts black or leaden blue-black.

Total length 2310 millim.

Lower Siam, Malay Peninsula and Archipelago. Recorded from most localities in the Peninsula.

Dr. Annandale observes that this nocturnal snake is very vicious, and drums with its tail on the ground when alarmed. Mr. Ridley, on the contrary, describes it as a very quiet snake, becoming quite tame very shortly after capture. Its food consists of small mammals, frogs, lizards, other snakes, fish, and even slugs.

185. *Dipsadomorphus jaspideus*.

Triglyphodon jaspideum, Dum. & Bibr. *Erp. Gén.* vii, p. 1093 (1854).

Dipsas boops, Günth. *Rept. Brit. Ind.* p. 309, pl. xxiv, fig. G (1864).

Dipsadomorphus jaspideus, Bouleng. *Cat. Sn.* iii, p. 73 (1896).

Anterior palatine and mandibular teeth feebly enlarged. Eye as long as the snout. Rostral broader than deep; internasals as long as the præfrontals; frontal $1\frac{1}{4}$ to $1\frac{1}{3}$ times as long as broad, much longer than its distance from the end of the snout, as long as or a little shorter than the parietals; loreal as long as deep or deeper than long; one præocular, narrowly separated from the frontal; 2 postoculars; temporals 2+2; 8 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields; posterior chin-shields as long as or longer than the anterior, separated from each other by scales. Scales in 21 rows, vertebral row strongly enlarged. Ventrals 243-266; anal entire; subcaudals 140-166. Light brown or reddish above, mottled and speckled with black or dark brown, and with more or less distinct blackish cross-bars interrupted on the vertebral line; a series of large whitish spots on each side, partly on the ventrals; all the head-shields spotted with black, the larger spots light-edged; a black, light-edged

longitudinal streak on the occiput; yellowish beneath, speckled with brown.

Total length 1400 millim.; tail 370.

Java and Borneo. Obtained in Kelantan by Dr. A. G. H. Smart and in Selangor by Mr. Butler, but nowhere common. Recorded from Singapore by F. Müller, Verh. Nat. Ges. Basel, vii, 1882, p. 151.

186. *Dipsadomorphus drapiezii*.

Dipsas drapiezii, Boie, Isis, 1827, p. 559.

Dipsadomorphus drapiezii, Bouleng. Cat. Sn. iii, p. 74 (1896); S. Flower, P. Z. S. 1896, p. 889.

Anterior palatine and mandibular teeth moderately enlarged. Eye as long as snout. Rostral broader than deep; internasals shorter than the præfrontals; frontal as long as broad or slightly longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal small or absent; one præocular, in contact with or narrowly separated from the frontal; 2 postoculars; temporals 2+2, 2+3, or 3+3; 8 upper labials, third, fourth, and fifth, or fourth and fifth, entering the eye; 5 or 6 lower labials in contact with the anterior chin-shields, which are as long as or a little longer than the posterior. Scales in 19 rows, vertebral row scarcely enlarged. Ventrals 250-276; anal entire; subcaudals 114-163. Pale brown above with dark transverse spots, or brown with yellowish or reddish, dark-edged pale transverse bands each of which ends in a white spot on the side of the belly; brownish white below, uniform or speckled with brown, with two more or less distinct brown longitudinal lines.

Total length 1524 millim.

Malay Peninsula and Archipelago. Recorded from Malacca and Singapore.

187. *Dipsadomorphus nigriceps*.

Dipsas nigriceps, Günth. Ann. & Mag. Nat. Hist. (3) xii, 1863, p. 359.

Dipsadomorphus nigriceps, Bouleng. Cat. Sn. iii, p. 72 (1896).

Dipsadomorphus pallidus, Bouleng. Fascic. Mal., Zool. i, p. 164, fig. (1903).

Anterior palatine and mandibular teeth enlarged. Snout longer than eye. Rostral broader than deep; frontal as long as broad, or a little longer than broad, as long as its distance from the end of the snout, shorter than the parietals; loreal as long as deep or longer than deep; one præocular, in contact with or narrowly separated from the frontal; two postoculars; temporals 1+2, 2+3, or 3+3; 8 upper labials, third, fourth, and fifth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are usually shorter than the posterior. Scales in 21 rows, vertebral row strongly enlarged. Ventrals 240-263; anal entire; subcaudals 140-154. Head uniform blackish or

purplish grey above; body reddish or pale greyish brown, uniform or irregularly mottled with darker, sometimes with the dorsal series of small black spots; upper lip and lower parts yellowish white; belly and tail often speckled with grey.

Total length 1650 millim.; tail 410.

Borneo, Java, and Selangor. The pale variety named *D. palidus* was described from a single specimen from Jalor.

188: *Dipsadomorphus cynodon*.

Dipsas cynodon, Boie, Isis, 1827, p. 559; Günth. Rept. Brit. Ind. p. 308 (1869).

Dipsas cynodon, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 924 (1847).

Dipsadomorphus cynodon, Bouleng. Cat. Sn. iii, p. 78 (1896); S. Flower, P. Z. S. 1899, p. 681.

Malay name, *Ular sawa burong*.

Anterior palatine and mandibular teeth very strongly enlarged. Rostral broader than deep; internasals shorter than the præfrontals; frontal as long as broad or slightly longer than broad, as long as or a little longer than its distance from the end of the snout, shorter than the parietals; loreal square, or longer than deep; one præocular, narrowly separated from the frontal; 2 postoculars; temporals 2+2, 2+3, or 3+3; 8 to 10 upper labials, three entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are smaller than the posterior. Scales in 23 (rarely 25) rows, vertebral row strongly enlarged. Ventrals 248-290; anal entire; subcaudals 114-159. Yellowish or pale reddish brown above, usually with dark brown or black transverse spots or cross-bars, or dark brown or black, with more or less distinct lighter cross-bars; a dark streak on each side of the head, behind the eye; belly yellowish, uniform or speckled or marbled with brown, or entirely black.

Total length 2450 millim.

From Assam and Burma to the Malay Peninsula and Archipelago; generally distributed in the Malay Peninsula (Penang, Prov. Wellesley, Perak, Selangor, Johore Bahru, Jalor, Malacca, Singapore).

A specimen taken by Dr. Annandale, coiled up on a bush about four feet above the ground, was sluggish in demeanour and made little attempt to escape.

Genus *PSAMMODYNASTES*.

Günth. Cat. Col. Sn. p. 140 (1858).

Maxillary teeth 9 to 11, third or third and fourth much enlarged, fang-like, followed by a short interspace, last enlarged and grooved; anterior mandibular teeth strongly enlarged. Head

distinct from neck, with angular canthus rostralis; eye rather large, with vertically elliptic or subelliptic pupil; nostril in a single nasal; frontal very narrow. Body cylindrical; scales

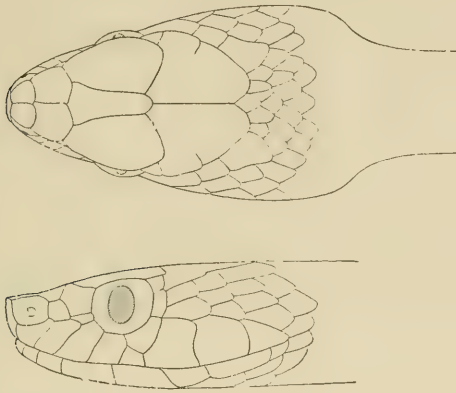


Fig. 53.—Head of *Psammodynastes pulverulentus*.

smooth, without pits, in 17 or 19 rows; ventrals rounded. Tail moderate or rather short; subcaudals in two rows.

South-Eastern Asia. Two species are known:—

Two pairs of chin-shields separating the lower labials	<i>P. pulverulentus</i> , p. 173.
Third lower labial very large, bordering the mental groove behind the small anterior chin-shields	<i>P. pictus</i> , p. 174.

189. *Psammodynastes pulverulentus*.

Psammodphis pulverulenta, Boie, Isis, 1827, p. 547.

Psammodynastes pulverulentus, Günth. Rept. Brit. Ind. p. 292 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 363 (1890); id. Cat. Sn. iii, p. 172 (1896); Wall, Journ. Nat. Hist. Soc. Bombay, xx, p. 72, figs. (1910).

Snout short, pointed or somewhat turned up in the adult. Rostral broader than deep; internasals much shorter than the præfrontals; frontal twice to twice and a half as long as broad, much narrower, in the middle, than the supraocular, much longer than its distance from the end of the snout, a little shorter than the parietals; loreal about as long as deep, often transversely divided into two; 1 or 2 præ- and 2 to 4 postoculars; temporals 2+3 (rarely 2+2); 8 upper labials, third, fourth, and fifth entering the eye; 3 (rarely 4) lower labials in contact with the anterior chin-shields, which are followed by two smaller pairs.

Scales in 17 (rarely 19) rows. Ventrals 146-175; anal entire; subcaudals 44-66. Dark brown or ochraceous above, with or without small darker and lighter spots; head usually with symmetrical longitudinal markings; a more or less distinct dark streak on each side of the head, passing through the eye; usually a dark brown band along each side; lower parts powdered with brown, and with dark brown spots or longitudinal lines.

Total length 610 millim.; tail 130.

Eastern Himalayas and Southern China to the Malay Peninsula and Archipelago. Recorded from Prov. Wellesley, Perak, Pahang, and Jalor.

Noteworthy for its unprepossessing, viper-like appearance, this snake appears to be as a rule of a lively, vicious disposition. There are however exceptions, as a specimen caught by Major Wall in Burma, although very active, and taking up a menacing attitude, made no efforts to bite. This species is ovoviviparous, and feeds on lizards and frogs. It is the only snake at all common at high elevations over 5000 feet.

190. *Psammodynastes pictus*.

Günth. Cat. Col. Sn. p. 251 (1858); Bouleng. Cat. Sn. iii, p. 174 (1896); Laidlaw, P. Z. S. 1901, ii, p. 578.

Body more slender and tail longer than in the preceding. Internasals as long as or a little shorter than the præfrontals; frontal $2\frac{1}{2}$ to 3 times as long as broad; third lower labials very large, bordering the mental groove. Ventrals 152-169; subcaudals 60-78. Back with dark or light spots or transverse bars between two light stripes; whitish beneath, speckled with brown, or with scattered black dots.

Total length 475 millim.; tail 90.

Malay Peninsula, Sumatra, Biliton, Borneo. Recorded from Bukit Besar by Laidlaw. I have examined a specimen from Selangor preserved in the Kuala Lumpur Museum.

Genus **DRYOPHIS**.

Dalman, Œfvers. of Zool. Arb., Stockholm, 1822.

Maxillary teeth 12 to 15, one or two in the middle much enlarged, fang-like, and followed by an interspace, after which the teeth are very small; one or two posterior grooved fangs, situated below the posterior border of the eye; mandibular teeth increasing in length to the third or fourth, which is very large, fang-like. Head elongate, distinct from neck, with strong canthus rostralis and concave lores; eye rather large, with horizontal pupil; nostril in the posterior part of a single nasal; frontal narrow, more or less bell-shaped. Body much elongate and compressed;

scales smooth, without pits, disposed obliquely, in 15 rows, vertebral row slightly enlarged; ventrals rounded. Tail long, subcaudals in two rows.

South-Eastern Asia. Two species in the Malay Peninsula.

Essentially arboreal and ovoviviparous.

191. *Dryophis prasinus*.

Boie, Isis, 1827, p. 545; Bouleng. Faun. Brit. Ind., Rept. p. 369 (1890); id. Cat. Sn. iii, p. 180 (1896); S. Flower, P. Z. S. 1896, p. 890, and 1899, p. 682.

Dryinus prasinus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 928 (1847).

Tragops prasinus, Günth. Rept. Brit. Ind. p. 303 (1864).

Malay names, *Ular puchok* and *ular daun*.

Snout acutely pointed, projecting, rather more than twice as long as the eye. Internasals usually in contact with the labials; 1 to 4 small loreals between the præfrontal and the labials; frontal as long as or a little longer than its distance from the end of the snout, a little longer than the parietals; one præocular, in contact with the frontal; 2 postoculars; temporals 2+2 or 3+3, rarely 1+2; 9 upper labials, fourth, fifth, and sixth entering the eye; 4 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales in 15 rows, usually faintly keeled on sacral region. Ventrals 194-235; anal divided (rarely entire); subcaudals 154-207. Bright green, pale olive, or grey-brown, with a yellow line along each side of the lower parts; interstitial skin of the neck black and white.

Total length 1790 millim.; tail 600.

Eastern Malayas and Indo-China to Malay Peninsula and Archipelago. Very common and generally distributed in the Malay Peninsula. Some specimens are gentle, whilst others are snappish or even fierce. This snake feeds chiefly on lizards and frogs, which it paralyses by the poison injected through the grooved posterior fangs.

192. *Dryophis xanthozona*.

Boie, Isis, 1827, p. 545; Bouleng. Cat. Sn. iii, p. 180 (1896).

Dryinus prasinus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 928 (1847).

Malay name, *Ular kunyet*.

Distinguished from the preceding by the somewhat shorter snout, and fewer shields below. Ventrals 186-195; anal entire (rarely divided); subcaudals 115-156.

Total length 1080 millim.; tail 410.

Java. Obtained in Penang by Cantor, and in Trang (Western Siamese Malay States) by Messrs. Robinson and Kloss.

Genus **DRYOPHIOPS.**

Bouleng. Cat. Sn. iii, p. 193 (1896).

Maxillary teeth 20, subequal, the last two or three a little enlarged and grooved; anterior mandibular teeth enlarged. Head elongate, distinct from neck, with distinct canthus rostralis; eye rather large, with horizontal pupil; nasal entire; frontal narrow, bell-shaped. Body slender, compressed; scales smooth, oblique, with apical pits, in 15 rows; ventrals with suture-like lateral keel and a notch on each side corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals.

A single species in the Malay Peninsula.

193. **Dryophiops rubescens.**

Dipsas rubescens, Gray, Ill. Ind. Zool. ii, pl. lxxxiv, fig. 2 (1834).

Chrysopelea rubescens, part., Günth. Rept. Brit. Ind. p. 299 (1864).

Dryophiops rubescens, Bouleng. Cat. Sn. iii, p. 194 (1906).

Rostral twice as broad as deep; internasals shorter than the præfrontals; frontal once and a half to once and two thirds as long as broad, as long as its distance from the end of the snout, shorter than the parietals; loreal much elongate; one præocular, forming a suture with the frontal; 2 or 3 postoculars; temporals 2+2; 9 upper labials, fourth, fifth, and sixth entering the eye; 4 or 5 lower labials in contact with the anterior chin-shields, which are much shorter than the posterior. Scales in 15 rows. Ventrals 188-199; anal divided; subcaudals 111-136. Bronzy or reddish brown above, with small black spots; upper surface of head with wavy longitudinal markings; a dark streak on each side of the head, passing through the eye; a median dark streak on the occiput and neck; labials with a few small black spots; lower parts yellow in front, reddish behind, dotted with darker, with or without scattered small black spots.

Total length 750 millim.; tail 210.

Obtained in Kelantan by Dr. A. G. H. Smart. The type specimen is believed to be from the Malay Peninsula, and one specimen from the north of Penang Island is in the Selangor Museum. Otherwise this snake is known from Siam, Sumatra, Borneo, and the Mentawai and Natuna Islands.

An essentially arboreal type. A specimen preserved in the British Museum had swallowed a *Draco melanopogon*.

Genus **CHRYSOPELEA.**

Boie, Isis, 1827, p. 520.

Maxillary teeth 20 to 22, subequal, the last three a little longer and grooved; anterior mandibular teeth longest. Head distinct

from neck: eye rather large, with round pupil. Body elongate, compressed; scales smooth or feebly keeled, oblique, with apical pits, in 17 rows; ventrals with suture-like lateral keel and a notch on each side corresponding to the keel. Tail long; subcaudals in two rows, keeled and notched like the ventrals.

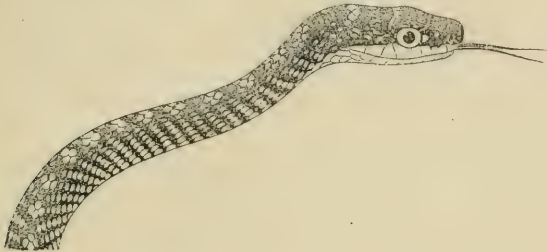


Fig. 54.—Head of *Chrysopelea ornata* (after Sordelli).

These tree-snakes, the opisthoglyphous analogues of the *Dendrophis*, are known as Flying-Snakes, from the habit they have of shooting down from trees and descending to the ground at an oblique angle, the body being kept rigid the whole time of the "flight." Mr. Shelford, who has investigated the phenomenon (P. Z. S. 1906, p. 227), finds that the ventral surface between the lateral keels, which he compares to hinges, can be drawn inwards, so that the snake becomes deeply concave along the ventral surface; at the same time there is a slight dorso-ventral flattening of the body. During this muscular contraction the snake is like a piece of bamboo bisected longitudinally, and is buoyed up in such a way as to explain its parachute-like descent from trees.

Two species are known in the Malay Peninsula.

194. *Chrysopelea ornata*.

Coluber ornatus, Shaw, Zool. iii, p. 477 (1802).

Chrysopelea ornata, Boie, l. c.: Bouleng. Faun. Brit. Ind., Rept. p. 371 (1890); id. Cat. Sn. iii, p. 196 (1896); S. Flower, P. Z. S. 1899, p. 682; Wall, Journ. Nat. Hist. Soc. Bombay, xviii, p. 227, pl. vi (1908).

Leptophis ornatus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 934 (1847).

Chrysopelea ornata, part., Günth. Rept. Brit. Ind. p. 299 (1864).

Snout much depressed, squarely truncate. Rostral broader than deep; internasals nearly as long as the præfrontals; frontal once and one third to once and two thirds as long as broad, nearly as long as its distance from the end of the snout, as long as or slightly shorter than the parietals; loreal small and elongate (rarely fused with the præfrontal); one præocular, often in

contact with the frontal; 2 postoculars; temporals 2+2; 9 or 10 upper labials, fifth and sixth, or fourth, fifth, and sixth entering the eye; 5 lower labials in contact with the anterior chin-shields, which are shorter than the posterior. Scales smooth or faintly keeled, in 17 rows. Ventrals 200-238, last usually divided; anal divided; subcaudals 106-138. Coloration very variable. Head black with yellow cross-bars and spots. Malay specimens black above, each scale with a round greenish-yellow spot or green with the scales black-edged; usually larger coral-red spots on the back, resembling a series of tetrapetalous flowers; ventrals greenish yellow, usually edged with black. Young yellowish green with black transverse bands.

Total length 1120 millim.; tail 310.

India, Ceylon, Burma, and Southern China to Malay Peninsula and Archipelago. Generally distributed in the Malay Peninsula.

Feeds on lizards, chiefly Geckos, and frogs, occasionally on bats. Some individuals are of gentle disposition, others are quite the reverse. Cantor says this species is remarkable for its gentleness, whilst Captain Flower describes it as the fiercest snake he has met. Although its bite appears to be harmless to man, it has, according to Flower, the effect of stupefying lizards to some extent. It is diurnal in its habits, and may be seen moving about in the hottest midday sunshine.

According to Cantor, the female lays 6 to 8 white, elongated cylindrical eggs.

195. *Chrysopelea chrysochlora*.

Dendrophis chrysochloros, Schleg. Phys. Serp. ii, p. 234 (1837).

Leptophis ornatus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 934 (1847).

Chrysopelea ornata, part., Günth. Rept. Brit. Ind. p. 299 (1864).

Chrysopelea chrysochlora, Bouleng. Cat. Sn. iii, p. 198 (1896); S. Flower, P. Z. S. 1899, p. 685.

Head rather shorter and snout less depressed than in the preceding species. Scales smooth, in 17 rows, less oblique than in the preceding. Ventrals 181-199; subcaudals 98-120. Above, with yellow black-edged narrow transverse bands separated by broad bright red interspaces; head olive-brown above, with a red chevron-shaped cross-band, pointing forwards, behind the eyes; a black line on each side of the head; lips yellow; ventral shields pale olive-green between the keels, bright lemon-yellow on the sides.

Total length 739 millim.

Burma, Malay Peninsula and Archipelago. Recorded from Penang, Johore, Kelantan, Selangor, and Singapore.

Subfamily HYDROPHIINÆ.

Synopsis of the Genera.

- I. Ventral shields, if at all distinct, very small.
- A. Nasal shields in contact with each other on the median line of the snout.
1. Symphysial shield exposed.
- No ventral shields; scales all juxtaposed HYDRUS, p. 180.
- Ventral shields distinct at least in the anterior part of the body; scales imbricate in the anterior part of the body HYDROPHIS, p. 181.
- Ventral shields distinct at least in the anterior part of the body; scales all juxtaposed ENHYDRIS, p. 192.
2. Symphysial shield narrow, partly concealed in a deep groove in the chin ENHYDRINA, p. 193.
- B. Nasal shields separated by internasals; scales all juxtaposed THALASSOPHIS, p. 194.
- II. Ventrals large; scales all imbricate.
- Nostrils on upper surface of snout AIPYSURUS, p. 195.
- Nostrils lateral PLATURUS, p. 196.

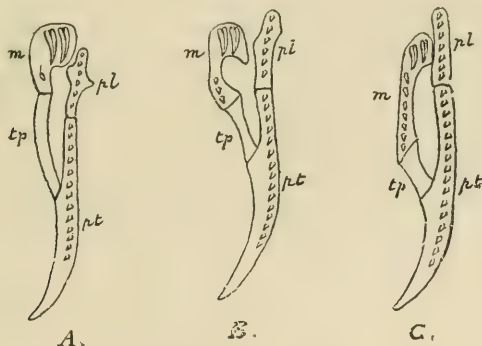


Fig. 55.—Views of right maxillo-palatal arch.

A. *Platurus*. B. *Enhydris*. C. *Hydrus*.

m. Maxillary. pl. Palatine. pt. Pterygoid. tp. Transpalatine or Ectopterygoid.

The presence or the absence of a groove on the small teeth behind the poison-fangs has been used by me for defining genera, but it has been shown, by Stejneger and by Wall, that this character must be given up, the groove being found to be present in species believed to be deprived of it, when a sufficiently strong magnifying power is applied to the examination of the teeth. The

generic distinction between *Hydrophis* and *Distica* is consequently abandoned.

The snakes of this and the following subfamily, constituting the Series *Proteroglypha*, or Poisonous Colubrine Snakes, are all highly dangerous to man, unless of gentle disposition, such as *Platurus* among the Sea-Snakes, and *Callophis* and *Doliophis* among the terrestrial forms. The physiological action of their venoms, so far as these have been investigated, is very different from that of the Viperine Snakes; the paralytic action upon the nervous system is their best marked feature. Respiratory paralysis is quickly brought about in Mammals by bringing the poisons into contact with the central nervous mechanism which controls respiration. By far the most active poison is that of the Common Sea-Snake, *Enhydrina valakadien*; next in order follow *Bungarus candidus*, *Naia tripudians*, *Naia bungarus*, and *Bungarus fasciatus*.

For a recent *resumé* of our knowledge of Snake-poison, cf. C. J. Martin and G. Lamb in T. C. Albutt and H. D. Rolleston's 'System of Medicine,' 1907.

With the exception of *Platurus*, and possibly also *Aipysurus*, the Hydrophiinæ are absolutely aquatic, never leaving the water, and feeding on fishes and crustaceans. With two exceptions, they only occur in salt water. According to Cantor, the large individuals are very ferocious, the young ones less so. Fortunately for the fishermen, who often bring them up in their nets, the light blinds these snakes, which, when out of their element, become sluggish and soon expire. The fishermen in the Straits of Malacca are aware of the dangerous nature of these snakes, and therefore take care to destroy them while landing the fishes; they call them *Ular laut*, "serpents of the sea," among which, however, the innocuous *Chersydrus granulatus* is also comprised. On the Patani Coast they are called *Ular terang* or *gerang*, or *Ular gelireh*.

All sea-snakes bring forth live young.

Enhydrina valakadien is extremely common on the coasts of the Malay Peninsula; the other species are comparatively rare.

On the habits, cf. Cantor, Trans. Zool. Soc. ii, p. 303 (1841).

Genus HYDRUS.

Schneid. Hist. Amph. i, p. 233 (1799).

Maxillary bone longer than the ectopterygoid, not extending forwards as far as the palatine; poison-fangs rather short, followed by 7 or 8 small teeth. Nostrils superior; snout long; head-shields large, nasals in contact with each other; a præocular, no loreal. Body rather short; scales hexagonal or squarish, juxtaposed; no distinct ventrals.

A single species.

196. *Hydrus platurus*.

Anguis platurus, Linn. Syst. Nat. i, p. 391 (1766).

Hydrus bicolor, Schneid. l. c. p. 242; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1056 (1847).

Pelamis bicolor, Günth. Rept. Brit. Ind. p. 382 (1864); Fayrer, Thanatoph. Ind. pl. xvii (1874).

Hydrus platurus, Bouleng. Faun. Brit. Ind., Rept. p. 397 (1890); id. Cat. Sn. iii, p. 267 (1896).

Rostral as deep as broad or a little broader than deep; frontal large, at least as long as the snout or the parietals; one or two præ- and two or three postoculars; one or two suboculars sometimes present; temporals small and numerous; 7 or 8 upper labials; chin-shields small or indistinct. 45 to 47 scales round the body, smooth in the female and young, laterals and ventrals rough with one, two, or three small tubercles in the male. Black and yellow, the markings very variable, or black above and brown beneath, with a yellow lateral band; tail usually yellow with black spots.

Total length 700 millim.; tail 80.

Indian Ocean; Tropical and Sub-tropical Pacific. The most widely-distributed sea-snake. Recorded from the Province Wellesley, Singapore, and the Gulf of Siam.

Genus **HYDROPHIS**.

Daudin, Hist. Rept. vii, p. 372 (1803).

Maxillary longer than the lower aspect of the ectopterygoid, not extending forwards as far as the palatine; poison-fangs large,

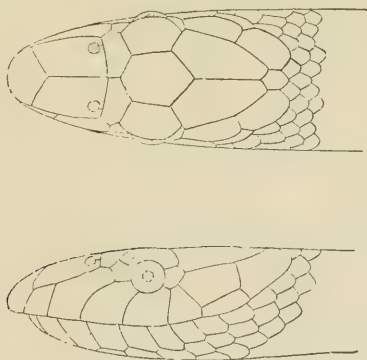


Fig. 56.—Head of *Hydrophis gracilis*.

followed by a series of 4 to 18 small teeth. Head moderate or small; nostrils superior, pierced in a single or divided nasal shield, which is in contact with its fellow; head-shields large; præocular

present; loreal usually absent. Body more or less elongate, often very slender anteriorly; scales on anterior part of body imbricate; ventrals very small, if distinct.

Indian and Pacific Oceans, from the Persian Gulf to Japan and New Caledonia.

So far, only 15 species can be recorded from the coasts of the Malay Peninsula, but many more will be discovered.

Synopsis of the Species.

- I. Head not remarkably small, nor neck remarkably slender.
 - A. All the scales distinctly imbricate; ventrals usually in pairs, except quite anteriorly; no chin-shields; 9 or 10 upper labials; 39-47 scales round neck, 48-57 round body* *H. stokesii*, p. 183.
 - B. Scales on posterior part of body feebly imbricate or juxtaposed; one or two pairs of chin-shields; 7 or 8 upper labials.
 1. Eye as long as or a little longer than its distance from the mouth; second pair of chin-shields, if distinct, separated by several scales; 2 or 3 superposed anterior temporals; 35-42 scales round neck, 40-50 round body *H. ornatus*, p. 184.
 2. Eye much shorter than its distance from mouth in the adult; two pairs of chin-shields, in contact on the middle line, or posterior pair separated by a single scale; 27-33 scales round neck, 32-45 round body.
 - A single large anterior temporal; scales smooth or with a central tubercle or short obtuse keel *H. brugmansii*, p. 184.
 - A single large anterior temporal; scales very strongly keeled, many of the keels broken up into tubercles *H. wrayi*, p. 185.
 - Two superposed anterior temporals; scales very strongly keeled, the keels often broken up into tubercles *H. cyanocinctus*, p. 185.
 - C. Scales slightly imbricate, 15-17 round neck, 19-21 round body; eye as long as its distance from mouth; 5 upper labials, followed by a large temporal descending to the edge of the mouth. *H. jerdonii*, p. 186.

* At its thickest point.

II. Head very small; neck very slender; eye not much shorter than its distance from mouth.

A. 23-40 scales round neck, 33-55 round body.

1. Two superposed anterior temporals.

35-38 scales round neck, 48-50 round body;

ventrals 280-309

H. cærulescens, p. 187.

27-29 scales round neck, 39 round body;

ventrals 310-331

H. nigrocinctus, p. 187.

2. A single anterior temporal.

a. Third labial not in contact with præfrontal.

α. Frontal as long as its distance from rostral.

Rostral broader than deep; 31-40 scales

round neck, 40-50 round body; ventrals

310-438

H. diadema, p. 188.

Rostral broader than deep; 31 scales round

neck, 55 round body; ventrals 422

H. rhombifer, p. 188

Rostral nearly as deep as broad; 25-31

scales round neck, 40-48 round body;

ventrals 345-500

H. fasciatus, p. 189.

β. Frontal much shorter than its distance from rostral.

5 upper labials; 25 scales round neck, 33

round body; ventrals 360

H. klossi, p. 190.

6 or 7 upper labials; 33-45 scales round neck,

43-45 round body; ventrals 240-290

H. torquatus, p. 190.

c. Third labial in contact with præ-

frontal; 23-25 scales round neck,

41-47 round body; ventrals 412-

456

H. cantoris, p. 191.

B. 19-21 scales round neck, 29-33 round

body; ventrals 225-297

H. gracilis, p. 191.

197. *Hydrophis stokesii*.

Hydrus stokesii, Gray, in Stokes, Discov. Austral. i, p. 502, pl. iii (1846).

Hydrophis annulatus, Gray, Cat. Sn. p. 59 (1849).

Hydrophis stokesii, Günth. Rept. Brit. Ind. p. 363 (1864).

Distira stokesii, Bouleng. Faun. Brit. Ind., Rept. p. 408 (1890);

id. Cat. Sn. iii, p. 288 (1896).

Head moderate; body stout. Eye shorter than its distance from the mouth. Rostral as deep as broad; frontal longer than broad, as long as or slightly longer than its distance from the rostral; one præ- and two postoculars; 9 or 10 upper labials, fourth, fifth, and sixth entering the eye, if not divided to form a series of suboculars; 2 or 3 superposed anterior temporals; no chin-shields. 39 to 47 scales round neck, 48 to 57

round thickest part of body; scales much imbricate in the adult, pointed, keeled, the keels frequently broken up into two tubercles. Ventrals usually distinct only quite anteriorly, then in pairs and not larger than the adjoining scales, 230-267. Yellowish or pale brownish, with broad black dorsal cross-bands, or with complete black annuli.

Total length 1510 millim.; tail 200.

From the Mekran Coast and the Chinese Sea to the North Coast of Australia. Two specimens from Singapore (one of which is the type of Gray's *H. annulatus*) are preserved in the British Museum.

This snake produces 12 to 14 young, the length of which is from 30 to 42 millim.

198. *Hydrophis ornatus*.

Aturia ornata, Gray, Zool. Misc. p. 61 (1842).

Hydrophis ocellata, Gray, Cat. Sn. p. 53 (1849); Günth. Rept. Brit. Ind. p. 378, pl. xxv, fig. P (1864).

Hydrophis ornata, Günth. op. cit. p. 376, pl. xxv, fig. V.

Hydrophis ellioti, Günth. op. cit. p. 377, pl. xxv, fig. N.

Distira ornata, Bouleng. Faun. Brit. Ind., Rept. p. 411 (1890); id. Cat. Sn. iii, p. 290 (1896).

Head moderate; body moderately elongate. Eye as long as or a little longer than its distance from the mouth. Rostral broader than deep; frontal longer than broad, as long as or a little longer than its distance from the rostral or the end of the snout; one præ- and two or three postoculars; 2 or 3 superposed anterior temporals; 7 or 8 upper labials, third and fourth entering the eye; anterior chin-shields in contact, posterior, if distinct, separated by 2 or 3 scales. 35 to 42 scales round neck, 40 to 50 round thickest part of body; scales feebly imbricate anteriorly, juxtaposed and hexagonal in the middle of the body, smooth in the young, with a central tubercle or short keel in the adult. Ventrals feebly enlarged, 210-300. Young with blackish cross-bars, tapering on the sides, and with one or more lateral series of roundish dark spots; the bands may be confluent in some specimens, which are uniform blackish olive above and white beneath.

Total length 1200 millim.; tail 130.

From the Persian Gulf to North Australia. Recorded from the Gulf of Siam, and obtained at Patani by the Skeat Expedition.

199. *Hydrophis brugmansii*.

Boie, Isis, 1827, p. 554.

Hydrus striatus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1047 (1847).

Hydrophis cyanocincta, part., Günth. Rept. Brit. Ind. p. 367 (1864).

Hydrophis robusta, Günth. op. cit. p. 364; Fayrer, Thanatoph. Ind. pl. xxi (1874).

Distira robusta, Bouleng. Faun. Brit. Ind., Rept. p. 409 (1890).

Distira brugmansii, Bouleng. Cat. Sn. iii, p. 292 (1896).

Head moderate; body elongate. Eye shorter than its distance from the mouth. Rostral broader than deep; frontal much longer than deep, as long as its distance from the rostral or the end of the snout; one præ- and one or two postoculars; a single large anterior temporal, sometimes descending to the border of the mouth; 7 upper labials, third and fourth, or third, fourth, and fifth entering the eye; two pairs of chin-shields, in contact on the middle line. 27 to 31 scales round neck, 32 to 40 round thickest part of body; scales rhomboidal and subimbricate, smooth or each with a more or less distinct central tubercle or short obtuse keel. Ventrals distinct throughout, smooth or bituberculate, 300-354. Greenish yellow above, dorsal scales with black margins, with black cross-bands or annuli, which are narrower than the interspaces between them; sides and lower parts yellow; end of tail black.

Total length 1800 millim.; tail 120.

Persian Gulf to Malay Archipelago. Obtained at Penang by Cantor.

200. *Hydrophis wrayi*.

Distira wrayi, Bouleng. Ann. & Mag. Nat. Hist. (7) v, p. 307 (1900).

Head moderate; body long, rather strongly thickened posteriorly. Eye minute. Rostral considerably broader than deep; frontal nearly twice as long as broad, slightly shorter than its distance from the rostral; one præ- and one postocular; a single very large anterior temporal, nearly reaching the oral border; 7 upper labials, third and fourth entering the eye; two pairs of chin-shields, in contact with each other. 27 scales round neck, 37 round thickest part of body; scales feebly imbricate, very strongly keeled, many of the keels broken up into two tubercles. Ventrals small, bicarinate, the keels mostly broken up into two tubercles, 296. Tail ending in a spine-like compressed scale. Blackish, with 67 narrow light annuli, which are olive on the back, yellow on the sides and on the belly.

Total length 940 millim.

Known from a single male specimen obtained on the Perak Coast.

201. *Hydrophis cyanocinctus*.

Daud. Hist. Rept. vii, p. 383 (1803); Günth. Rept. Brit. Ind. p. 367, part. (1864); Fayrer, Thanatoph. Ind. pl. xxiii (1874).

Hydrus striatus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1047 (1847).

Hydrophis aspera, Gray, Cat. Sn. p. 55 (1849); Günth. op. cit. p. 365.

Distira cyanocincta, Bouleng. Faun. Brit. Ind., Rept. p. 410 (1890); id. Cat. Sn. iii, p. 294 (1896).

Head moderate; body elongate. Eye shorter than its distance from the mouth in the adult. Rostral slightly broader than deep; frontal much longer than broad, as long as its distance from the rostral or the end of the snout; one præ- and two postoculars; two superposed anterior temporals; 7 or 8 upper labials, third and fourth, fourth and fifth, or third, fourth, and fifth entering the eye; two pairs of chin-shields, in contact on the middle line, or posterior pair separated by one scale. 27 to 33 scales round neck, 39 to 45 round thickest part of body; scales rhomboidal and sub-imbricate, with a short keel which is very strong, and broken up into two or three tubercles, in adult males. Ventrals distinct throughout, smooth or with two or more tubercles, 281-385. Greenish olive above, with dark olive or black cross-bars or annuli, broadest on the back, and sometimes joined by a black band running along the belly; or yellowish with a black vertebral stripe sending off a few bar-like processes on the neck.

Total length 1500 millim.; tail 140.

Persian Gulf to Japan and New Guinea. The type of Gray's *H. aspera* is from Singapore.

202. *Hydrophis jerdonii*.

Hydrus nigrocinctus, var., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1050, pl. xl, fig. 8 (1847).

Kerilia jerdonii, Gray, Cat. Sn. p. 57 (1849).

Hydrophis jerdonii, Günth. Rept. Brit. Ind. p. 362, pl. xxv, fig. B (1864); Fayer, Thanatoph. Ind. pl. xx (1874).

Distira jerdonii, Bouleng. Faun. Brit. Ind., Rept. p. 408 (1890); id. Cat. Sn. iii, p. 299 (1896).

Head short, snout declivous and rather pointed; body moderately elongate. Eye as long as its distance from the mouth. Rostral as deep as broad; frontal longer than broad, nearly as long as its distance from the end of the snout; one præ- and one postocular; 5 upper labials, third and fourth entering the eye; a single large anterior temporal, descending to the labial margin; one or two pairs of chin-shields. 15 or 17 scales round neck, 19 or 21 round body; scales broader than long, slightly imbricate, strongly keeled. Ventrals feebly enlarged, more or less distinctly bituberculate, 224-238. Olive above, yellowish beneath, with black cross-bands, which form complete rings in young and half-grown specimens; a black spot may be present between each pair of annuli.

Total length 910 millim.; tail 100.

Bay of Bengal, coasts of the Malay Peninsula and Borneo. Cantor obtained a single specimen, captured in a fishing-stake off Penang; several were found on the Patani Coast by the Skeat Expedition and by Messrs. Annandale and Robinson.

203. *Hydrophis cærulescens*.

Hydrus cærulescens, Shaw, Zool. iii, p. 561 (1802).

Hydrophis cærulescens, Günth. Rept. Brit. Ind. p. 365, pl. xxv, fig. C (1864); Bouleng. Faun. Brit. Ind., Rept. p. 400 (1890); id. Cat. Sn. iii, p. 275 (1896).

Head very small; body long, very slender anteriorly. Eye as long as its distance from the mouth. Rostral broader than deep; frontal longer than broad, shorter than its distance from the rostral; one præ- and one postocular; two superposed anterior temporals; 7 upper labials, third and fourth entering the eye; chin-shields very small, posterior pair separated by scales. 35 to 38 scales round neck, 48 to 50 round thickest part of body; scales rhomboidal, imbricate, with a strong short keel. Ventrals distinct throughout, 280-309. Grey above, with black cross-bands, broadest on the back, forming complete rings or interrupted on the belly; head uniform black.

Total length 665 millim.; tail 75.

Coasts of India and the Malay Peninsula. Dr. Cantor's collection contained a specimen from Penang. Others were obtained on the Perak Coast by Mr. L. Wray and on the Patani Coast by Messrs. Annandale and Robinson.

204. *Hydrophis nigrocinctus*.

Daud. Hist. Rept. vii, p. 380 (1803); Günth. Rept. Brit. Ind. p. 368, pl. xxv, fig. L (1864); Fayrer, Thanatoph. Ind. pl. xxv (1874); Bouleng. Faun. Brit. Ind., Rept. p. 400 (1890); id. Cat. Sn. iii, p. 277 (1896).

Head small; body long, slender anteriorly. Eye as long as its distance from the mouth. Rostral broader than deep; frontal longer than broad, as long as its distance from the end of the snout; one præ- and one or two postoculars; a small loreal sometimes present; two superposed anterior temporals; 7 upper labials, third and fourth entering the eye; two pairs of chin-shields, posterior separated by scales. 27 or 29 scales round neck, 39 round thickest part of body; scales imbricate, rhomboidal, keeled. Ventrals feebly enlarged, 310-331. Pale olive above, yellowish beneath, with black annuli, which are broader on the back.

Total length 1000 millim.; tail 100.

Bay of Bengal and Straits of Malacca. Obtained also on the East Coast, at Patani, by the Skeat Expedition.

205. *Hydrophis diadema*.

Hydrophis diadema, Günth. Rept. Brit. Ind. p. 373, pl. xxv, fig. S (1864).

Hydrophis stricticollis, Günth. op. cit. p. 376, pl. xxv, fig. R; Fayrer, Thanatoph. Ind. pl. xxviii (1874).

Hydrophis obscurus (non Daud.), Bouleng. Faun. Brit. Ind., Rept. p. 403 (1890); id. Cat. Sn. iii, p. 284 (1896); S. Flower, P. Z. S. 1899, p. 687.

Head very small; body long, extremely slender anteriorly. Eye as long as its distance from the mouth. Rostral broader than deep; frontal longer than broad, as long as its distance from the rostral or the end of the snout; one præ- and one or two postoculars; a single anterior temporal; 7 or 8 upper labials, third and fourth entering the eye; two pairs of chin-shields, posterior small and usually separated by scales. 31 to 40 scales round neck, 40 to 50 round thickest part of body; scales rhomboidal, imbricate, feebly keeled in the female, strongly in the male, the keels often broken up into tubercles. Ventrals very feebly enlarged, bicarinate in the male, 310-438. Olive or dark green above, with yellowish cross-bars, which form complete rings round the slender part of the body, whilst further down they are interrupted on the back; a yellow spot on the snout and a yellow streak on each side of the upper surface of the head; or pale olive with dark cross-bands forming rings on the anterior part of the body.

Total length 970 millim.; tail 105.

Bay of Bengal to Malay Archipelago; Gulf of Siam.

Hydrophis obscurus and *chloris* of Daudin are identical with *H. coronatus*, Gthr., as pointed out by Wall (Mem. Asiat. Soc. Bengal, ii, p. 202), not with this species.

206. *Hydrophis rhombifer*.

Bouleng. Ann. & Mag. Nat. Hist. (7) v, p. 306 (1900).

Head very small; body long, extremely slender anteriorly. Eye a little longer than its distance from the mouth. Rostral considerably broader than deep; frontal small, longer than broad, as long as its distance from the rostral; one præ- and one postocular; a single anterior temporal; 7 upper labials, third and fourth entering the eye; two pairs of small chin-shields, in contact with each other. 31 scales round the neck, 55 round the body; scales smooth, rhomboidal and imbricate anteriorly, elsewhere hexagonal, subimbricate, each with one or several small tubercles. Ventrals very small, 422. Head and neck black, the latter with two series of round yellowish spots; body yellowish white, with a series of blackish rhomboidal spots on the back, these spots confluent on the vertebral line; end of tail black.

Total length 620 millim.; tail 47.

A single specimen is known, from the coast of Perak.

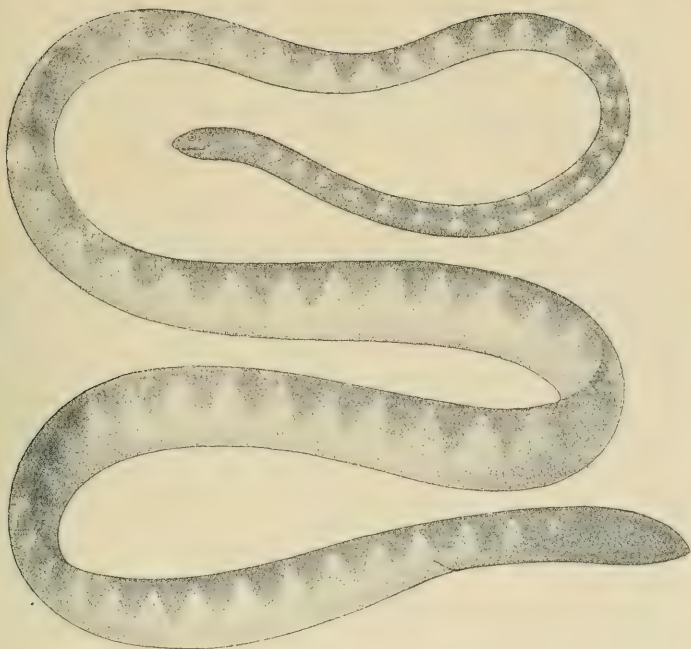


Fig. 57.—*Hydrophis rhombifer*.

207. *Hydrophis fasciatus*.

Hydrus fasciatus, Schneid. Hist. Amph. i, p. 240 (1799).

Hydrophis chloris (non Daud.), Günth. Rept. Brit. Ind. p. 370 (1864).

Hydrophis lindsayi, Günth. op. cit. p. 371.

Hydrophis atriceps, Günth. l. c. pl. xxv, fig. I.

Hydrophis fasciatus, Peters, Mon. Berl. Ac. 1872, p. 849, pl. i, fig. 1; Bouleng. Faun. Brit. Ind., Rept. p. 404 (1890); id. Cat. Sn. iii, p. 281 (1896).

Head very small; body long, very slender anteriorly. Eye a little longer than its distance from the mouth. Rostral nearly as deep as broad; frontal longer than broad, as long as its distance from the rostral; one præ- and one or two postoculars; a single anterior temporal; 6 or 7 upper labials, third and fourth entering the eye; two pairs of small chin-shields, in contact with each other. 25 to 31 scales round neck, 40 to 48 round thickest part of body; all scales rhomboidal and imbricate, or scales sub-imbricate or juxtaposed on the posterior part of the body, on the neck smooth, on the body with a small tubercle or short keel.

Ventrals feebly enlarged, 345-500. Head and neck black, the latter with yellowish cross-bands; body pale, with black cross-bands or annuli, which are broadest on the back.

Total length 1000 millim.; tail 85.

Coasts of India to China and New Guinea. Cantor obtained a young specimen at Penang.

208. *Hydrophis klossi*, sp. n.

Head small; body long, very slender anteriorly. Eye nearly as long as its distance from the mouth. Rostral a little broader than deep; frontal very small, as long as broad, not half as large as the supraocular; a single anterior temporal; 5 upper labials, fourth, or third and fourth, entering the eye; two pairs of chin-shields, in contact with each other. 25 scales round the neck, 33 round thickest part of body; scales imbricate, smooth on anterior part of body, keeled on posterior part. Ventrals feebly enlarged, 360. Head and anterior part of body black, the former with small yellowish spots, the latter with yellowish cross-bars, which gradually extend to the belly and transform into rings; body olive above, yellowish beneath, with black rings, which are broader than the light interspaces on the back, narrower on the belly.

Total length 900 millim.; tail 75.

This species is based on a single specimen, from Thuala, Selangor, received from the Selangor Museum.

209. *Hydrophis torquatus*.

Hydrus nigrocinctus (non Daud.), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1049 (1847).

Hydrophis torquatus, Günth. Rept. Brit. Ind. p. 369, pl. xxv, fig. H (1864); Bouleng. Faun. Brit. Ind., Rept. p. 402 (1890); id. Cat. Sn. iii, p. 283 (1896).

Head small; body long, very slender anteriorly. Eye as long as its distance from the mouth. Rostral broader than deep; frontal small, as long as broad or a little longer than broad, shorter than its distance from the rostral; one præ- and one postocular; a single anterior temporal; 6 or 7 upper labials, third and fourth entering the eye; two pairs of chin-shields, in contact with each other. 33 or 35 scales round neck, 43 or 45 round thickest part of body; scales imbricate and keeled. Ventrals feebly enlarged, 240-290. Pale greyish olive, with blackish cross-bands tapering on the sides.

Total length 560 millim.; tail 50.

Bay of Bengal and Straits of Malacca.

210. *Hydrophis cantoris*.

Hydrus gracilis, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1051 (1847).

Hydrophis cantoris, Günth. Rept. Brit. Ind. p. 374, pl. xxv, fig. U (1864); Bouleng. Faun. Brit. Ind., Rept. p. 405 (1890); id. Cat. Sn. iii, p. 281, pl. xiv (1896).

Head very small; body long, extremely slender anteriorly. Diameter of eye equal to or a little less than its distance from the mouth. Rostral deeper than broad; frontal small, longer than broad, hardly as long as its distance from the rostral; one præ- and one postocular; a single anterior temporal; 6 upper labials, third in contact with the præfrontal, third and fourth entering the eye; two pairs of small chin-shields, in contact with each other. 23 to 25 scales round neck, 41 to 47 round thickest part of body; scales smooth, rhomboidal and imbricate anteriorly, elsewhere hexagonal, juxtaposed, each with two or three tubercles one before the other. Ventrals hardly enlarged, 412-456. Body dark olive or blackish anteriorly, with yellowish cross-bands above; posterior part of body olive above, yellowish on the sides; tail with olive vertical bars; a blackish streak along the belly.

Total length 7600 millim.; tail 130.

Bay of Bengal and Straits of Malacca. Cantor's type specimen is from Penang.

211. *Hydrophis gracilis*.

Hydrus gracilis, Shaw, Zool. iii, p. 560 (1802).

Hydrophis gracilis, Günth. Rept. Brit. Ind. p. 373 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 404 (1890); id. Cat. Sn. iii, p. 280 (1896).

Head very small; body long, extremely slender anteriorly. Eye at least as long as its distance from the mouth. Rostral as deep as broad; frontal very small, longer than broad, hardly as long as its distance from the rostral; one præ- and one postocular; a single anterior temporal; 6 upper labials, third and fourth entering the eye; two pairs of small chin-shields, in contact with each other. 19 to 21 scales round neck, 29 to 33 round thickest part of body; scales smooth, rhomboidal and imbricate anteriorly, elsewhere hexagonal, juxtaposed, each with two or more tubercles, which are feeble in the female and very strong in the male. Ventrals distinct only anteriorly, very feebly enlarged or split into two posteriorly, 225-297. Bluish black or greyish olive above in the adult, with more or less distinct lighter cross-bands anteriorly. Young with the head and neck black, the latter with light transverse bands; body with rhombic black

cross-bands continued to the belly or sub-interrupted on the sides; or black with a series of elliptical vertical whitish spots on each side.

Total length 1020 millim.; tail 90.

From the coast of Persia to the Malay Archipelago.

A young specimen was obtained on the Patani Coast by Messrs. Annandale and Robinson and was erroneously referred by me to *H. wrayi*. The species is recorded from Singapore by Hanitsch (Rep. Raffles Mus. 1897, p. 10).

Genus **ENHYDRIS**.

Merrem, Tent. Syst. Amph. p. 140 (1820).

Maxillary bone as long as the ectopterygoid, extending forwards as far as the palatine, with two large poison-fangs followed by 2 to 4 small teeth. Nostrils superior; head-shields large; nasals in contact with each other; a præocular; loreal present or absent. Body short and stout; scales hexagonal or squarish, juxtaposed; ventrals very feebly developed, if at all distinct.

Two species:—

Parietals broken up into small shields *E. curtus*, p. 192.

Parietals large *E. hardwickii*, p. 193.

212. *Enhydris curtus*.

Hydrus curtus, Shaw, Zool. iii, p. 562 (1802).

Enhydris curtus, Merr. Tent. p. 140 (1820); Bouleng. Faun. Brit. Ind., Rept. p. 396 (1890); id. Cat. Sn. iii, p. 300 (1896); Laidlaw, P. Z. S. 1901, ii, p. 580.

Hydrophis curta, Günth. Rept. Brit. Ind. p. 379 (1864); Fayrer, Thanatoph. Ind. pl. xxiv (1874).

Rostral broader than deep; parietals broken up into small shields; one præ- and one or two postoculars; no loreal; 2 or 3 superposed anterior temporals; 7 upper labials, 1, 2, or 3 entering the eye; chin-shields very small and separated by scales, or quite indistinct. 30 to 38 scales round anterior part of body, 33 to 42 round middle, with a very feebly developed tubercle or short keel; scales on lower surface with a strong spinose tubercle in males, ventrals with two. Ventrals 150–200. Above with dark transverse bands, broadest in the middle; these bands usually very dark, nearly black, rarely rather indistinct (in old specimens); end of tail black.

Total length 750 millim.; tail 75.

Persian Gulf to Malay Archipelago. Obtained at Singapore by the Skeat Expedition.

213. *Enhydris hardwickii*.

Lapemis hardwickii, Gray, Ill. Ind. Zool. ii, pl. lxxxvii, fig. 2 (1834).

Hydrus pelamidoides, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1054 (1847).

Hydrophis hardwickii, Günth. Rept. Brit. Ind. p. 380, pl. xxv, fig. W (1864).

Hydrophis loreata, Günth. l. c.

Enhydris hardwickii, Bouleng. Faun. Brit. Ind., Rept. p. 397 (1890); id. Cat. Sn. iii, p. 301 (1896).

Very similar to the preceding, but rostral as deep as broad or slightly broader than deep and parietals large and entire; a loreal sometimes present. 25 to 33 scales round anterior part of body, 34 to 37 round middle. Ventrals 130-200. The dark bands often form complete rings round the body.

Total length 750 millim.; tail 80.

Bay of Bengal to New Guinea. Recorded from the Straits of Malacca, Singapore, and the Patani Coast.

Genus **ENHYDRINA**.

Gray, Cat. Sn. p. 47 (1849).

Maxillary scarcely longer than the ectopterygoid, not extending forwards quite so far as the palatine, with two large poison-fangs followed by 4 small teeth. Nostrils superior; head-shields large, nasals in contact with each other; a præocular, no loreal. Symphysial shield narrow, partly concealed in a deep groove in the chin. Body moderately elongate; scales imbricate; ventrals distinct but very small.

A single species.

214. *Enhydrina valakadien*.

Hydrus valakadyen, Boie, Isis, 1827, p. 554.

Hydrus schistosus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1053 (1847).

Enhydrina bengalensis, Gray, Cat. Sn. p. 48 (1849); Günth. Rept. Brit. Ind. p. 381 (1864); Fayrer, Thanatoph. Ind. pl. xviii (1874).

Enhydrina valakadyen, Gray, l. c.; Bouleng. Faun. Brit. Ind. p. 406, fig. (1890); id. Cat. Sn. iii, p. 302 (1896).

Rostral deeper than broad; frontal small, longer than broad, shorter than its distance from the end of the snout; one præ- and one or two postoculars; 7 or 8 upper labials, fourth or third and fourth entering the eye; usually a single anterior temporal; chin-shields small or indistinct. 40 to 60 scales round anterior part of body, 50 to 70 round middle; scales feebly imbricate, with a small tubercle or short keel, which is stronger in males.

Ventrals very feebly enlarged, 230–314. Young olive or grey above, with black transverse bands, broadest in the middle and tapering to a point on the sides; in the adult these bands are usually less distinct, some specimens being uniform dark grey above; sides and lower parts whitish.

Total length 1300 millim.; tail 190.

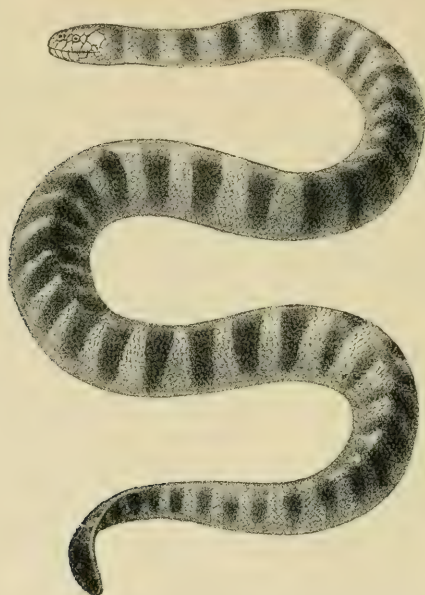


Fig. 58.—*Enhydrina valakadien*.

Persian Gulf to New Guinea. Cantor says, “Incredibly numerous in the Bay of Bengal, at Penang and Singapore, far more so than any known terrestrial serpent. The fishing-nets are hardly ever worked but one or more are among the contents.” Has also been obtained on the Patani Coast and in the Gulf of Siam.

Genus **THALASSOPHIS.**

Schmidt, Abh. Naturw. Hamb. ii, p. 75 (1852).

Distinguished from *Hydrophis* and *Enhydris* by the presence of a pair of internasal shields separating the nasal.

Coasts of the Malay Peninsula and Archipelago. One species in the Straits of Malacca.

215. *Thalassophis annandalii*.

Distira annandalii, Laidlaw, P. Z. S. 1901, ii, p. 579, pl. xxxv, fig. 1.

Thalassophis annandalii, Bouleng. Fascic. Malay., Zool. i, p. 16 (1903).

Head moderate; body short and stout, strongly compressed behind the neck. Rostral broader than deep; nasals small, separated by a pair of large internasals, which widen in front; upper head-shields more or less broken up, the parietals small and separated from each other, and sometimes also from the frontal, by very small scales; frontal and supraocular large; one or two præ- and one or two postoculars; eye separated from the labials by one or two suboculars; temporal scales small, numerous; 9 to 12 upper labials; chin-shields usually broken up into scales. Scales extremely small, 90 to 100 round the middle of the body, juxtaposed; dorsals with a more or less distinct central tubercle or short keel. Ventrals very feebly enlarged, 310-370. Pale greyish olive above, white beneath; back with dark cross-bars, narrower than the interspaces, tapering to a point on the sides.

Total length 600 millim.; tail 80.

The type specimen of this very remarkable snake was obtained at Patani by the Skeat Expedition. Further specimens have since been found in the same locality by Messrs. Annandale and Robinson.

The water in which the type specimen was taken is stated by Dr. Annandale to have been fresh to the taste.

Genus *AIPYSURUS*.

Lacép. Ann. Mus. Paris, iv, p. 197 (1804).

Maxillary a little longer than the ectopterygoid, extending forwards beyond the palatine; poison-fangs moderate, followed by 8 to 10 small teeth. Snout short; nostrils superior; head-shields large or broken up into scales; nasals in contact with each other. Body moderate; scales imbricate; ventrals large, keeled in the middle.

Malay Seas and Western Tropical Pacific Ocean.

A single species has been found on the coasts of the Malay Peninsula.

216. *Aipysurus eydouxi*.

Tomogaster eydouxi, Gray, Cat. Sn. p. 59 (1849).

Aipysurus anguilliformis, Günth. Rept. Brit. Ind. p. 357 (1864); Boettg. Zool. Anz. 1892, p. 420.

Aipysurus eydouxi, Bouleng. Cat. Sn. iii, p. 304 (1896); S. Flower, P. Z. S. 1896, p. 893, and 1899, p. 688.

Rostral a little broader than deep; upper head-shields regular; frontal large, longer than its distance from the end of the snout,

as long as or a little longer than the parietals; nasal in contact with or narrowly separated from the præocular; one præ- and two postoculars; temporals 1 + 2 or 2 + 2; 6 upper labials, fourth entering the eye; anterior chin-shields shorter than the posterior, which are separated by an azygous shield. Scales smooth, in 17 rows. Ventrals 134-142. Dark brown above, with cross-bands of yellow, black-edged scales, often broken up on the vertebral line; these bands widening towards the belly, which is yellow, with or without dark brown spots.

Total length 559 millim.; tail 80.

Coasts of Singapore, Java, and the Philippines. Boettger records three specimens from Singapore, and Flower obtained one caught on some flooded land near the Serangoon Road.

Another specimen, from Java, was kept alive by Flower for about a month. It was gentle when handled, never attempting to bite. It could move fast, but awkwardly, on dry land, and sometimes would crawl out of the water of its own accord.

Genus **PLATURUS**.

Daudin, Hist. Rept. vii, p. 223 (1803).

Maxillary much shorter than the ectopterygoid, extending forwards beyond the palatine, with two large poison-fangs; one or two small teeth near the posterior extremity of the maxillary.

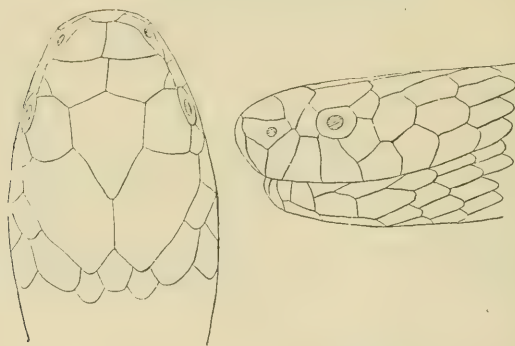


Fig. 59.—Head of *Platurus laticaudatus*.

Head shields large; nostrils lateral, the nasals separated by internasals; præocular present; no loreal. Body much elongate; scales smooth and imbricate; ventrals and subcaudals large.

Eastern parts of the Indian Ocean and West Pacific.

Only one species has been recorded from the Malay Peninsula.

These snakes approach in many respects the genus *Bungarus* in the following subfamily.

217. *Platurus colubrinus*.

Hydrus colubrinus, Schneid. Hist. Amph. i, p. 238 (1799).

Laticauda scutata (non Laur.), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1046 (1847).

Platurus scutatus, Günth. Rept. Brit. Ind. p. 356 (1864).

Platurus colubrinus, Bouleng. Faun. Brit. Ind., Rept. p. 395 (1890); id. Cat. Sn. iii, p. 308 (1896).

Rostral deeper than broad; an azygous shield between the præ-frontals and sometimes one or two between the internasals; frontal as long as or slightly shorter than the parietals; one præ- and two postoculars; temporals 1+2 (rarely 2+2); 6 or 7 upper labials, third and fourth entering the eye. Scales in 21 to 25 rows. Ventrals not keeled, 195-240; subcaudals 30-45. Olive or grey above, yellowish beneath, with black or blackish annuli which are as wide as the interspaces between them or narrower; some or all of the annuli may be interrupted on the belly. Iris black.

Total length 1270 millim.; tail 125.

Bay of Bengal to Chinese Sea and Western South Pacific Ocean. Recorded from Penang and Singapore.

This snake is not so absolutely aquatic as the other sea-snakes, and has occasionally been found crawling about out of the water. It is not known ever to bite.

The allied *Platurus laticaudatus*, Linn., distinguished by the absence of azygous shields on the snout, will probably be found on the coasts of the Malay Peninsula, as its distribution is nearly the same as that of *P. colubrinus*.

Subfamily ELAPINÆ.

Synopsis of the Genera.

I. Body moderately slender.

Vertebral scales enlarged BUNGARUS, p. 198.

Vertebral scales not enlarged; neck more or less dilatable, with oblique scales NAIA, p. 200.

II. Body very slender; scales in 13 rows, vertebrals not enlarged.

Poison-gland not extending beyond the head; anal divided..... CALLOPHIS, p. 203.

Poison-gland extending along each side of the anterior third of the body; heart shifted back to second third of body; anal entire..... DOLIOPHIS, p. 204.

Genus **BUNGARUS**.

Daud. Hist. Rept. v, p. 263 (1803).

Poison-fangs followed by one to four small teeth. Head not or but slightly distinct from neck; eye small, with round or vertically subelliptic pupil; nostril between two nasals; no loreal. Scales smooth, oblique, without pits, in 13 to 17 rows, vertebral row enlarged, hexagonal; ventrals rounded. Tail moderate or short; subcaudals single or in two rows.

South-Eastern Asia.

Synopsis of the Species.

- | | |
|--|-------------------------------|
| Tail ending very obtusely; subcaudal shields single; anterior temporal shield scarcely longer than deep; scales in 15 rows | <i>B. fasciatus</i> , p. 198. |
| Tail tapering to a point; subcaudal shields single; anterior temporal much longer than deep; scales in 15 rows | <i>B. candidus</i> , p. 199. |
| Tail tapering to a point; subcaudal shields partly single, partly double; scales in 13 rows | <i>B. flaviceps</i> , p. 200. |

218. Bungarus fasciatus.

Pseudoboa fasciata, Schneid. Hist. Amph. ii, p. 283 (1801).

Bungarus fasciatus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1034 (1847); Günth. Rept. Brit. Ind. p. 343 (1864); Fayrer, Thana-topi. Ind. pl. ix (1874); Bouleng. Faun. Brit. Ind., Rept. p. 388 (1890); id. Cat. Sn. iii, p. 366 (1896); S. Flower, P. Z. S. 1899, p. 689; Wall, Journ. Nat. Hist. Soc. Bombay, xx, p. 933, pl. xv (1911).

Rostral much broader than deep; frontal longer than broad, as long as or longer than its distance from the end of the snout, as long as or a little shorter than the parietals; one præ- and two postoculars; temporals 1+2, anterior scarcely longer than deep; 7 upper labials, third and fourth entering the eye. An obtuse keel or ridge along the back and tail; latter ending very obtusely. Scales in 15 rows, vertebrals much enlarged, broader than long. Ventrals 200-234; anal entire; subcaudals single, 23-39. Annulate black and yellow, the black annuli as broad as the yellow or broader; head yellow, with a black band, widened behind, beginning between the eyes and extending to the nape; snout brown. Iris black; tongue flesh-coloured.

Total length 1450 millim.; tail 130.

India, Burma, Southern China to Malay Peninsula, Sumatra, and Java. Generally distributed in the Malay Peninsula, but nowhere common.

According to Flower, this snake is popularly confounded with

Dipsadomorphus dendrophilus. Laidlaw says (P. Z. S. 1901, ii, p. 580) the Malay of Biserat call the two by the same name (*Ular Katam tabu*), but they appear to distinguish them to some extent, regarding the *Dipsadomorphus* as non-poisonous, or at any rate not so poisonous as the *Bungarus*. Ridley (Journ. Str. Br. Asiat. Soc. 1899, p. 200) has observed it near the sea, in tidal waters. This species feeds, like the Krait, chiefly on other snakes, although occasionally on mice, lizards, and toads, even on fish.

According to Col. Evans (Journ. N. H. Soc. Bombay, xvi, p. 519, 1902), the eggs, 8 in number, are incubated by the mother, who secretes herself in a hole for the purpose.

219. *Bungarus candidus*.

Coluber candidus, Linn. Syst. Nat. i, p. 384 (1766).

Pseudoboa cærulea, Schneid. Hist. Amph. ii, p. 284 (1801).

Bungarus cæruleus, Daud. Hist. Rept. v, p. 270, pl. lxx, fig. 2 (1803); Günth. Rept. Brit. Ind. p. 343 (1864); Fayrer, Thanatoph. Ind. pl. x (1874); Bouleng. Faun. Brit. Ind., Rept. p. 388 (1890).

Bungarus semifasciatus, Boie, Isis, 1827, p. 552; Günth. op. cit. p. 344.

Bungarus candidus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1034 (1847); Bouleng. Cat. Sn. iii, p. 368 (1896); S. Flower, P. Z. S. 1899, p. 689.

Rostral broader than deep; frontal longer than broad, as long as its distance from the end of the snout, shorter than the parietals; one præ- and two postoculars; temporals 1+1 or 1+2; 7 upper labials, third and fourth entering the eye. Scales in 15 rows, vertebrals much enlarged, broader than long on the hinder half of the body. Ventrals 195-237; anal entire; subcaudals single, 37-56. Dark brown or purplish black above, with narrow white cross-bands or transverse series of small white spots often in pairs; lower parts white or pale yellow. Iris black. The Malay Archipelago specimens belong to the var. *cæruleus*, which is regarded as distinct from the typical form (from Java and Celebes) by some authors.

Total length 1100 millim.; tail 150.

India, Burma, and Southern China to Malay Peninsula and Archipelago.

The Krait, as this very deadly snake is called in India, appears to be of very rare occurrence in the Malay Peninsula, where it is on record from Penang and Kedah, while the Selangor Museum possesses specimens from near Kuala Lumpur. It bears a deceptive similarity in form and coloration to the harmless *Lycodon aulicus*. The poison of this and the preceding species of *Bungarus* is similar to that of the Cobra, acting chiefly on the central nervous system, death resulting from failure of the respiratory mechanism, probably owing to a direct action of the venom on the respiratory centre in the *medulla oblongata*. Although the true Krait is small and injects only a comparatively small quantity of

poison, it is far more deadly than the larger *Bungarus* or the Cobra, the toxicity being at least four times as great as in the latter. All authorities agree in describing the Krait as a quiet and shy snake, rarely biting except in self-defence or when hurt. Most accidents happen through barefooted people treading on these peaceful creatures. Yet more mortality is caused in India by the Krait than by any other snake.

The food of the Krait consists mainly of other snakes, but lizards, toads, and small mammals are occasionally eaten. The eggs, 6 to 10 in number, are deposited in holes in the ground.

220. *Bungarus flaviceps*.

Reinh. Vidensk. Selsk. Skrift. x, p. 267, pl. iii, fig. 4 (1843); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1033 (1847); Bouleng. Cat. Sn. iii, p. 371 (1896); S. Flower, P. Z. S. 1896, p. 894.

Megacerophis flaviceps, Günth. Rept. Brit. Ind. p. 346 (1864).

Rostral broader than deep; frontal as broad as long, or slightly longer than broad, as long as its distance from the end of the snout, shorter than the parietals; one præ- and two (rarely three) postoculars; temporals 1 + 2; 7 upper labials, third and fourth entering the eye. Scales in 13 rows, vertebrals strongly enlarged. Ventrals 193-237; anal entire; subcaudals 42-54, partly single, partly double. Black above, with or without a yellow vertebral stripe or a series of yellow dots along the vertebral line; head red or yellow; tail, and sometimes posterior part of body, orange-red; a yellow lateral streak may be present; belly brown, or yellow with the shields edged with brown. Iris and tongue black.

Total length 1850 millim.; tail 220.

Cochinchina, Tenasserim, Malay Peninsula, Sumatra, Borneo, and Java. Throughout the Federated Malay States, and in Penang and the adjacent parts of the mainland, but of rare occurrence.

This snake combines the structure of a *Bungarus* with the coloration of a *Callophis* or *Adeniphis*.

Genus **NAIA**.

Laurenti, Syn. Rept. p. 90 (1768).

Poison-fangs followed by one to three small teeth. Head not or but slightly distinct from neck, which is more or less dilatable (expanding into a "hood" supported by the anterior ribs); eye moderate, with round pupil; nostril between two nasals and the internasal; no loreal. Scales smooth, oblique, without pits, in 15 to 25 rows (or more on the neck); ventrals rounded. Tail moderate; subcaudals all or greater part in two rows.

Southern Asia and Africa.

The Cobras are represented by two species in the Malay Peninsula:—

- | | |
|--|--------------------------------|
| 23-29 scales across the neck, 17-21 across the body; ventrals 163-200; no large occipital shields..... | <i>N. tripudians</i> , p. 201. |
| 19-21 scales across the neck, 15 across the body; ventrals 215-262; a pair of large occipital shields behind the parietals | <i>N. bungarus</i> , p. 202. |

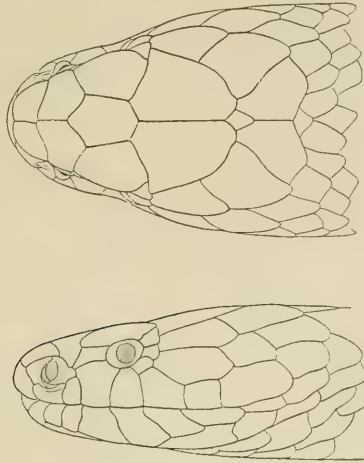


Fig. 60.—Head of *Naia bungarus*.

221. *Naia tripudians*.*

Merrem, Tent. Syst. Amph. p. 147 (1820); Günth. Rept. Brit. Ind. p. 338 (1864); Fayrer, Thanatoph. Ind. pls. i-vi (1874); Bouleng. Faun. Brit. Ind., Rept. p. 391, fig. (1890); id. Cat. Sn. iii, p. 380 (1896); S. Flower, P. Z. S. 1899, p. 690.

Naia sputatrix, Boie, Isis, 1827, p. 557.

Naia lutescens, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1038 (1847).

Malay name, *Ular tedong sendok*.

Rostral broader than deep, its upper portion measuring one fourth to one half its distance from the frontal; internasal in

* The Cobra occurring in the Malay Peninsula does not belong to the typical form with a spectacle-like marking on the hood, but to the vars. *fasciata*, Gray, *sputatrix*, Boie, and *leucodira*, Blgr. The present diagnosis applies only to these.

contact with the præocular; frontal as long as broad or longer than broad, as long as or a little longer than its distance from the rostral; one præ- and three postoculars; temporals 2 + 3 or 3 + 3; 7 upper labials, third deepest, seventh longest, third and fourth entering the eye. 23 to 29 scales across the neck, 17 to 21 across the body. Ventrals 163-200; anal entire; subcaudals 42-75. Yellowish, olive, dark brown, or black above, with or without a pale or bright yellow U- or O-shaped marking on the hood, sometimes followed by a yellow collar; sometimes some yellow or orange on the sides of the head and neck; lower surface of head and neck yellowish white, or bright yellow, usually followed by a black cross-bar, rest of lower parts dark brown or black; sometimes an azygous black spot under the neck, followed by one, two, or three pairs.

Total length 1830 millim.

Southern Asia, from Transcaspia to China and the Malay Peninsula and Archipelago.

Although generally distributed, the Cobra does not seem to be so numerous in the Malay Peninsula as in India, Burma, and Siam, yet it is common enough in some parts. According to Ridley (Journ. Str. Br. Asiat. Soc. 1899, p. 200), the specimens met with in the south of the Peninsula are nearly always inky black, further north they are brown, while in parts of Upper Perak and the adjacent districts of the Patani States, they are turmeric yellow. When annoyed, he adds, the Cobra sits up in the well-known manner, and makes a very curious snorting noise, holding its mouth open in the form of a circle and every now and then spitting its poison at its opponent. It never attempts to bite, but spits with great accuracy, at a distance of eight feet. It is nocturnal, and feeds on small mammals, batrachians and snakes. A female killed by Captain Flower in Siam contained 19 eggs.

The poison of the Cobra is very active, and often fatal to man, acting in the first place on the nervous system and then producing asphyxia. It contains a substance the direct action of which prevents the coagulation of blood.

222. *Naia bungarus*.

Hamadryas hannah, Cantor, Asiat. Res. xix, p. 87, pls. x-xii (1836).
Naia bungarus, Schleg. Phys. Serp. ii, p. 476, pl. xvii, figs. 8 & 9 (1837); Bouleng. Faun. Brit. Ind., Rept. p. 392 (1890); id. Cat. Sn. iii, p. 386 (1896); S. Flower, P. Z. S. 1899, p. 691.

Hamadryas ophiophagus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1037 (1847).

Ophiophagus elaps, Günth. Rept. Brit. Ind. p. 341 (1864); Fayrer, Thanatoph. Ind. pls. vii & viii (1874).

Malay names, *Ular tedong selar*; *ular kunyet terus* (immature).

Rostral broader than deep, just visible from above; internasal separated from the præocular; frontal once and one fourth to once and a half as long as broad, as broad as the supraocular, as long

as its distance from the end of the snout; a pair of large occipital shields; one præocular (rarely two); 3 postoculars; temporals 2+2; 7 upper labials, third deepest, seventh longest, third and fourth entering the eye. 19 or 21 scales across the neck, 15 across the body. Ventrals 215-262; anal entire; subcaudals 80-117, the anterior usually single. Yellowish or olive above, with or without more or less distinct dark cross-bands or annuli, or uniform dark brown or blackish; some young annulate black and yellow, others blackish with a yellow spot on each scale.

Total length 4500 millim.

India, Burma, and Southern China to Malay Peninsula and Archipelago. Generally distributed throughout the Malay Peninsula, as common or commoner than the Cobra, but essentially a jungle-haunting form.

The King Cobra or Hamadryad is reputed to be the most aggressive of all poisonous snakes, occasionally pursuing people. It feeds almost entirely on other snakes. A specimen 14½ feet long (which is about the average length of large specimens) is preserved in the Perak Museum, according to Flower.

On the habits of this snake in India, *cf.* G. H. Evans, Journ. Nat. Hist. Soc. Bombay, xiv, 1902, p. 409.

The venom of the King Cobra closely resembles that of its congener, causing gradual paralysis throughout the body, death taking place from interference with the respiratory apparatus.

Genus **CALLOPHIS.**

Gray, Ill. Ind. Zool. ii (1834).

No small teeth behind the poison-fangs. Head small, not distinct from neck; eye small, with round pupil; nostril between two nasals; no loreal. Body much elongate, slender; scales smooth, without pits, in 13 rows; ventrals rounded. Tail short, subcaudals in two rows.

South-Eastern Asia.

Two species in the Malay Peninsula:—

Six upper labials; ventrals 303-320 *C. gracilis*, p. 203.

Seven upper labials; ventrals 205-247 *C. maculiceps*, p. 204.

223. *Callophis gracilis*.

Gray, op. cit. pl. lxxxvi, fig. 1; Günth. Rept. Brit. Ind. p. 349 (1864); Bouleng. Cat. Sn. iii, p. 396 (1896).

Elaps nigromaculatus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1029, pl. xl, fig. 7 (1847).

Eye minute, about half as long as its distance from the mouth. Rostral broader than deep; frontal as long as its distance from the rostral or the end of the snout; one præ- and two postoculars; a single temporal; 6 upper labials, third and fourth entering the

eye. Scales in 13 rows. Ventrals 303-320; anal divided; subcaudals 21-28. Reddish or pale brown above, with three dark brown or black longitudinal lines passing through distant round dark brown or black spots, the lateral spots alternating with the vertebral; two outer rows of scales dark brown or black with a yellow longitudinal streak; belly and lower surface of tail barred black and yellow. Iris black; tongue bluish grey.

Total length 740 millim.; tail 35.

Malay Peninsula and Sumatra. Recorded from Penang, South Perak, and Singapore, and known from Selangor. Generally rare, except on Penang, where, according to Cantor, it is of no uncommon occurrence in the hills.

224. *Callophis maculiceps*.

Elaps melanurus (non Shaw), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1027, pl. xl, fig. 6 (1847).

Elaps maculiceps, Günth. Cat. Col. Sn. p. 232 (1858).

Callophis maculiceps, Günth. Rept. Brit. Ind. p. 351 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 384 (1890); id. Cat. Sn. iii, p. 397 (1896); Laidlaw, P. Z. S. 1901, ii, p. 580.

Eye measuring at least two thirds its distance from the mouth. Rostral broader than deep; frontal as long as its distance from the end of the snout; one præ- and two postoculars; a single temporal; 7 upper labials, third and fourth entering the eye. Scales in 13 rows. Ventrals 205-247; anal divided; subcaudals 21-32. Light bay above, strongly iridescent, with a distant series of black dots along each side of the back; head and nape black, with one or two yellow bands on each side; lower parts red; tail with two black rings. Iris black; tongue black.

Total length 485 millim.; tail 30.

This species, discovered by Cantor in the Province Wellesley, had not been found since in the Malay Peninsula, until obtained on Gunong Inas, Perak, by the Skeat Expedition. A local specimen is in the Selangor Museum. It is also known from Burma and CochinChina.

Genus **DOLIOPHIS**.

Girard, Proc. Ac. Philad. 1857, p. 182.

Characters of *Callophis*, except that the poison-glands, instead of being confined to the temporal region (as in most snakes) extend along each side of the body for about one third of its length, gradually thickening and terminating in front of the heart with club-shaped ends. The presence of this organ may be ascertained without dissection by feeling the thickening and rigidity of the cardiac region in the second third of the body, the heart being shifted further back than in other snakes owing to the extension of the glands.

South-Eastern Asia.

Two species in the Malay Peninsula. Both are called *Ular sina mata-hari*, "sunbeam snake," by the Malays of Patani.

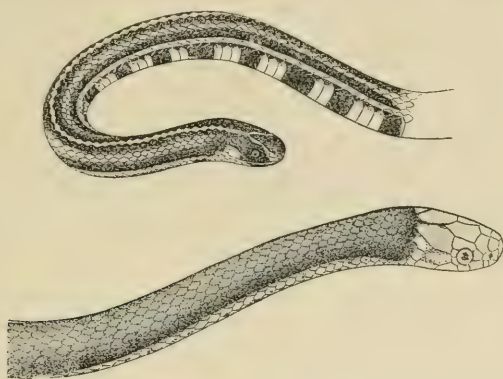


Fig. 61.—*Doliophis intestinalis* and *D. bivirgatus*, after Sordelli.

225. *Doliophis bivirgatus*.

Elaps bivirgatus, Boie, Isis, 1827, p. 556; Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1030 (1847).

Callophis bivirgatus, Günth. Rept. Brit. Ind. p. 348 (1864).

Doliophis bivirgatus, Bouleng. Cat. Sn. iii, p. 400 (1896); S. Flower, P. Z. S. 1896, p. 895, and 1899, p. 692.

Eye nearly as long as its distance from the mouth. Rostral a little broader than deep; frontal large, longer than broad, as long as or longer than its distance from the end of the snout, as long as or a little shorter than the parietals; one præ- and two post-oculars; temporals 1+1 or 1+2; 6 upper labials, third and fourth entering the eye. Scales in 13 rows. Ventrals 244-293; anal entire; subcaudals 34-53. Dark purple or blackish blue above, highly iridescent; head, tail, and lower parts coral-red; one or two pale blue lines on each side of the body, or a pale blue stripe along the two outer rows of scales. Iris and tongue black.

Total length 1810 millim.

Burma and Cochin-China to Malay Peninsula and Archipelago. Generally distributed in the Malay Peninsula, especially plentiful in the hill woods. A specimen from Kelantan, in Dr. Smart's collection, was captured in the act of swallowing an *Amblycephalus moellendorffii*.

Experiments on the action of the poison of this and the following species are much to be desired, in view of the extraordinary development of the poison-glands. These snakes feed chiefly on other snakes, but in captivity, Cantor says, they refuse

food and water, and die in a short time from inanition. They have never been observed to bite.

226. *Doliophis intestinalis*.

- Aspis intestinalis*, Laur. Syn. Rept. p. 106 (1768).
Elaps furcatus, Schneid. Hist. Amph. ii, p. 303 (1801).
Maticora lineata, Gray, Ill. Ind. Zool. ii, pl. lxxvi, fig. 2 (1834).
Elaps intestinalis, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1028 (1847).
Elaps trilineatus, Dum. & Bibr. Erp. Gén. vii, p. 1227 (1854).
Callophis intestinalis, Günth. Rept. Brit. Ind. p. 348 (1864).
Adeniophis intestinalis, Bouleng. Faun. Brit. Ind., Rept. p. 386 (1890).
Doliophis intestinalis, Bouleng. Cat. Sn. iii, p. 401 (1896); S. Flower, P. Z. S. 1899, p. 693.

As in the preceding, but ventrals 197–273 and subcaudals 15–33. Brown or blackish above, with darker or lighter longitudinal streaks: belly yellowish white or pale yellow, tail coral-red, both with black cross-bars. Three colour-varieties are known to occur in the Malay Peninsula:—

Var. *annectens*, Blgr. Dark brown above, blackish towards the middle of the back, with a yellow or orange narrow vertebral line.

Var. *lineatus*, Gray. Greyish, reddish, or purplish brown, with a pair of blackish dorsal lines bordering a scarlet vertebral stripe.

Var. *trilineatus*, D. & B. As in the preceding, but the bright vertebral stripe broken up by dark brown spots at regular intervals.

Total length 580 millim.; tail 45.

Burma, Malay Peninsula and Archipelago. Generally distributed. Capt. Flower says: "Of the Malay poisonous snakes this is perhaps the most frequently met with. I have come across it both in bright daylight and after dark, crawling slowly about; it is easily caught. What the effect of its poison on a man would be is, I believe, quite unknown; but from its small mouth and want of activity it can hardly be looked on as a dangerous species."

Family AMBLYCEPHALIDÆ.

Facial bones slightly movable, the præfrontal not in contact with the nasal; ectopterygoid (transpalatine) present; pterygoid short, not extending to quadrate or mandible; supratemporal rudimentary; maxillary horizontal, parallel with or converging posteriorly towards the palatine. Mandible without coronoid bone. Solid teeth in both jaws.

May be readily distinguished from the Colubridæ by the absence of a mental groove, the mouth being susceptible of but slight

expansion. Feed chiefly on worms and slugs. The vertical pupil indicates nocturnal habits.

Inhabitants of South-Eastern Asia and Tropical America. Represented by two genera in the Malay Peninsula:—

Subcaudals single HAPLOPELTURA, p. 207.
 Subcaudals in two rows AMBLYCEPHALUS, p. 208.

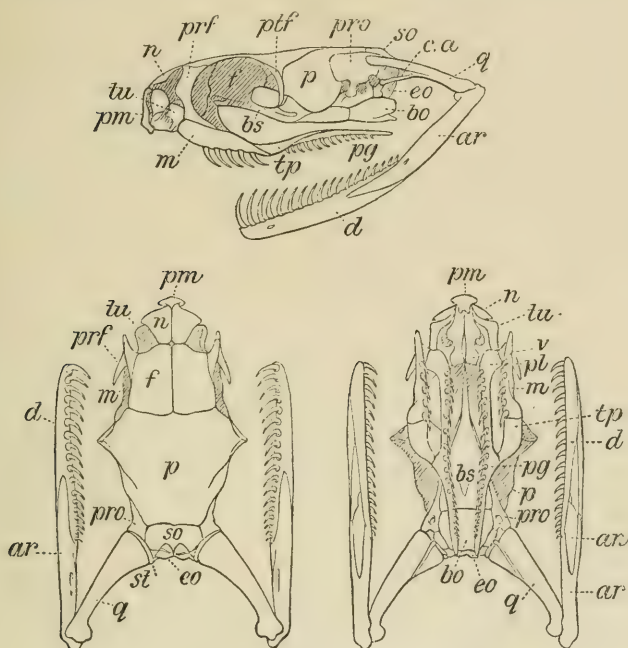


Fig. 62.—Skull of *Amblycephalus*.

- | | | |
|-----------------------|-------------------|---------------------|
| an. Angular. | n. Nasal. | q. Quadrate. |
| ar. Articular. | p. Parietal. | so. Supraoccipital. |
| bo. Basioccipital. | pl. Palatine. | sp. Splenial. |
| bs. Basisphenoid. | pm. Præmaxillary. | st. Supratemporal. |
| c.a. Columella auris. | prf. Præfrontal. | tp. Transpalatine. |
| d. Dentary. | pro. Prootic. | tu. Turbinal. |
| f. Frontal. | pt. Pterygoid. | v. Vomer. |
| m. Maxillary. | ptf. Postfrontal. | |

Genus **HAPLOPELTURA**.

Dum. & Bibr. Mém. Ac. Sc. xxiii, p. 463 (1853).

Maxillary bone very short, deep, with 5 subequal teeth; maxillary and mandibular teeth decreasing in size posteriorly. Head distinct from neck; eye large, with vertical pupil; nasal single. Body strongly compressed; scales smooth, without pits,

oblique, in 13 rows, vertebral row strongly enlarged; ventrals rounded. Tail moderate; subcaudals single.

A single species.

227. *Haplopeltura boa*.

Amblycephalus boa, Boie, Isis, 1828, p. 1034; Günth. Rept. Brit. Ind. p. 325 (1864).

Dipsas boa, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 925, pl. xl, fig. 3 (1847).

Haplopeltura boa, Bouleng. Cat. Sn. iii, p. 439 (1896); S. Flower, P. Z. S. 1899, p. 693; Bouleng. Fascic. Mal., Zool. i, p. 170 (1903).

Snout very short and deep. Rostral narrow, much deeper than broad; frontal not broader than the supraocular, once and two thirds to twice as long as broad, longer than its distance from the end of the snout, as long as or a little longer than the parietals; two or three enlarged occipitals; two or three superposed loreals, the lower often entering the eye, which is bordered by 6 to 8 shields in addition to the supraocular; temporals 3+3 or 4; 8 to 10 upper labials, none entering the eye; 2 pairs of lower labials in contact on the median line behind the symphysial; 3 or 4 pairs of large chin-shields, the anterior pair sometimes fused to a single azygous shield or preceded by an azygous shield. Scales in 13 rows. Ventrals 148-191; anal entire; subcaudals 88-127. Yellowish or pale brown above, yellowish beneath, mottled with dark brown; usually with large dark brown blotches, which may extend across the belly; a large dark brown blotch on the head; sides of head yellowish white, with three or more dark streaks radiating from the eye.

Total length 750 millim.; tail 220.

Malay Peninsula and Archipelago. Known from Penang Hills, Bukit Besar (Patani States), the Larut Hills in Central Perak, 2000 feet, and Kelantan. A specimen taken at Bukit Besar by Dr. Annandale was lying almost straight along the middle of the leaf of a small palm in the jungle. The whole coloration and attitude suggested a stick that had fallen from above, and the blunt snout and buff markings on the head appeared to represent that part of the stick which had been broken from its present branch.

Genus **AMBLYCEPHALUS**.

Kuhl, Isis, 1822, p. 474.

Maxillary bone very short, deep, with 5 or 6 subequal teeth; mandibular teeth gradually decreasing in length. Head distinct from neck; eye moderate, with vertical pupil; nasal single. Body more or less compressed; scales smooth or feebly keeled, without pits, more or less oblique, in 15 rows, vertebral row enlarged or not. Ventrals rounded. Tail moderate or short; subcaudals in two rows.

South-Eastern Asia. Four species in the Malay Peninsula.

Synopsis of the Species.

- I. A single shield between the nasal and the eye; one or two labials entering the eye.
- Six upper labials; symphysial in contact with an azygous chin-shield; ventrals 148-176 *A. lævis*, p. 209.
- Seven upper labials; symphysial in contact with an azygous chin-shield; ventrals 154-170 *A. malaccanus*, p. 209.
- Seven upper labials; first lower labial forming a suture with its fellow behind the symphysial; ventrals 183-194 *A. vertebralis*, p. 210.
- II. Loreal and præocular distinct; upper labials separated from the eye by one or two suboculars; symphysial in contact with a pair of chin-shields; ventrals 136-159 *A. moellendorffi*, p. 210.

228. *Amblycephalus lævis*.

Boie, Isis, 1827, p. 520; Bouleng. Faun. Brit. Ind., Rept. p. 415 (1890); id. Cat. Sn. iii, p. 441 (1896); Laidlaw, P. Z. S. 1901, ii, p. 581.

Pareas lævis, Günth. Rept. Brit. Ind. p. 328 (1864).

Rostral a little broader than deep; frontal as long as broad or a little broader than long, as long as or a little longer than its distance from the end of the snout, two thirds the length of the parietals; supraocular very small; præfrontal and loreal entering the eye; no præocular; one or two postoculars; temporals 2+2; 6 upper labials, third and fourth, or third, fourth, and fifth entering the eye, sixth very long; symphysial in contact with a small azygous chin-shield; third lower labial very large, forming a suture with its fellow; two pairs of large chin-shields, broader than long. Scales in 15 rows, smooth, vertebrales enlarged. Ventrals 148-176; anal entire; subcaudals 34-69. Brown above, with irregular transverse blackish cross-bands; sides dull orange; lower parts brownish or yellowish, spotted with brown or with transverse brown spots on the sides.

Total length 545 millim.; tail 65.

Java, Borneo, Natuna Islands, and Malay Peninsula. Dr. Annandale obtained a single specimen on the boundary between Legoh and Rhaman; its native name was given as *Ular kapak rimau* or "tiger axe-snake."

229. *Amblycephalus malaccanus*.

Asthenodipsas malaccana, Peters, Mon. Berl. Ac. 1864, p. 27, pl. —, fig. 3.

Amblycephalus malaccanus, Bouleng. Cat. Sn. iii, p. 442 (1906).

Rostral a little broader than deep; frontal as long as broad or a little broader than long, as long as or a little longer than its distance from the end of the snout, much shorter than the

parietals; supraocular small; præfrontal and loreal entering the eye; no præocular; two postoculars; temporals 2+2, the two upper sometimes fused; 7 upper labials, third and fourth entering the eye, seventh large; symphysial in contact with a small azygous shield; second or third lower labial very large, usually in contact with its fellow; two pairs of large chin-shields, broader than long. Scales in 15 rows, smooth, the three median rows a little enlarged. Ventrals 154-170; anal entire; subcaudals 26-55. Yellowish or pale brown above, with rather irregular dark brown cross-bars, which are interrupted on the spine; vertebral scales yellowish; head sometimes whitish; sides and lower surface of neck black; belly whitish, uniform or speckled with dark brown.

Total length 440 millim.; tail 50.

Originally described from 'Malacca' (read Malay Peninsula). Since found in Sumatra and Borneo.

230. *Amblycephalus vertebralis*.

Bouleng. Ann. & Mag. Nat. Hist. (7) v, p. 307 (1900).

Rostral slightly broader than deep; frontal slightly longer than broad, much longer than its distance from the end of the snout, a little shorter than the parietals; præfrontal and loreal entering the eye; no præocular; two postoculars; temporals 2+2; 7 upper labials, third and fourth entering the eye, seventh very long; first lower labial narrow, forming a suture with its fellow behind the symphysial; second lower labial in contact with an azygous chin-shield; 3 pairs of large chin-shields, followed by a very large azygous one, all broader than long. Body strongly compressed, keeled above. Scales in 15 rows, smooth, vertebrals strongly enlarged. Ventrals 183-194; anal entire; subcaudals 56-63. Reddish brown above, with small dark brown spots and ill-defined dark cross-bands; an interrupted yellow vertebral line, formed by a small spot on each median scale; labials and chin-shields yellowish, edged with dark brown; belly yellowish, with some brown spots on the sides.

Total length 460 millim.

Described from a single specimen obtained by Mr. L. Wray on Maxwell's Hill, Larut, Perak, at an altitude of 3000 feet. Specimens were also obtained by Mr. A. L. Butler in the same locality, and are now in the Selangor Museum.

231. *Amblycephalus moellendorffi*.

Pareas carinata, part., Günth. Rept. Brit. Ind. p. 326 (1864).

Pareas moellendorffi, Boettg. Ber. Offenb. Ver. 1885, p. 125.

Amblycephalus moellendorffi, Bouleng. Cat. Sn. iii, p. 443 (1896);

Laidlaw, P. Z. S. 1901, ii, p. 581; Bouleng. Fascic. Malay., Zool. i, p. 170 (1903).

Rostral nearly as deep as broad; frontal as long as broad or a little longer than broad, longer than its distance from the end of the snout, much shorter than the parietals; præfrontal entering the eye; loreal separated from the eye by one or two præoculars; one or two suboculars, sometimes fused with the postocular; temporals 2+2 or 3; 7 (rarely 8) upper labials, none entering the eye, last longest; 3 pairs of large chin-shields, anterior longer than broad and in contact with the symphysial. Scales in 15 rows, smooth, vertebrae not enlarged. Ventrals 136-159; anal entire; subcaudals 37-47. Brown or dark grey above, with irregular transverse series of black and white spots; a white nuchal collar usually present; lower parts white, spotted or dotted with black, at least on the sides.

Total length 350 millim.; tail 57.

Southern China to Malay Peninsula. Recorded from Jalor and Kelantan.

Called *Ular kapak* at Biserat, Jalor.

Family VIPERIDÆ.

Facial bones movable; præfrontal bone not in contact with nasal; ectopterygoid (transpalatine) present, extending to mandible; supratemporal present, attached scale-like to the skull and suspending quadrate; maxillary much abbreviated, erectile perpendicularly to ectopterygoid, supporting a pair of large poison-fangs without external groove. Mandible without coronoid bone.

Poisonous snakes including terrestrial, semiaquatic, arboreal, and burrowing types. In the Malay Region the passage from terrestrial to arboreal types is so gradual as to preclude their being referred to distinct genera. With a few exceptions, the *Viperidæ* are ovoviviparous. They are mostly semi-nocturnal.

Many of the *Viperidæ* are among the most dangerous poisonous snakes, but the Malayan *Lachesis* have comparatively small poison-glands, and it has been repeatedly ascertained that their bite does not produce death in man and large animals. The physiological action of Viperine poison is very different from that of the Colubrines of the Indian and Malay regions. It brings about coagulation of the blood and clotting of the pulmonary arteries, but its effect on the nervous system is not great and no individual group of nerve-cells appears to be picked out, and the effect upon respiration is not so direct. The influence upon the circulation is more striking than the effect upon the respiration, and the great depression which is a symptom of Viperine poisoning may be explained in this way.

The *Viperidæ* are divided into two subfamilies, according to the

presence (*Crotalinæ*) or absence (*Viperinæ*) of a deep pit on each side of the snout, between the nostril and the eye. The *Viperinæ*

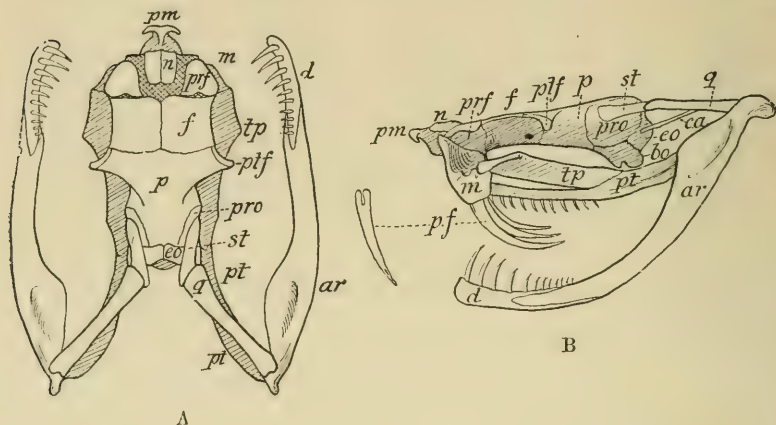


Fig. 63.—Skull of *Lachesis gramineus*.

A. Upper view. B. Side view.

ar. Articular.	m. Maxillary.	pro. Prootic.
bo. Basioccipital.	n. Nasal.	pt. Pterygoid.
ca. Columella auris.	p. Parietal.	ptf. Postfrontal.
d. Dentary.	pf. Poison-fang.	q. Quadrate.
eo. Exoccipital.	pm. Præmaxillary.	st. Supratemporal.
f. Frontal.	prf. Præfrontal.	tp. Transpalatine.

are not represented in the Malay Peninsula, from which only two genera of *Crotalinæ* are known :—

Upper surface of head covered with large symmetrical shields	ANCISTRODON, p. 212.
Upper surface of head covered with scales or small shields	LACHESIS, p. 214.

Genus **ANCISTRODON.**

Palisot de Beauv. Tr. Am. Philos. Soc. iv, p. 381 (1799).

Pupil vertical. Upper surface of head with nine large symmetrical shields. Body cylindrical; scales smooth (or keeled), with apical pits. Tail moderate or short; subcaudals in two rows (or single).

Aria, North and Central America.

A single species in the Malay Peninsula.

232. *Ancistrodon rhodostoma*.

Trigonocephalus rhodostoma, Boie, Isis, 1827, p. 561.

Caloselasma rhodostoma, Günth. Rept. Brit. Ind. p. 391 (1864).

Ancistrodon rhodostoma, Bouleng. Cat. Sn. iii, p. 527 (1896); id. Fascic. Malay., Zool. i, p. 170 (1903).

Snout pointed, somewhat turned up at the end. Rostral as deep as broad, or a little deeper than broad; frontal as long as or a little longer than its distance from the end of the snout, as long as or a little shorter than the parietals; upper præocular separated from the posterior nasal by a loreal; one or two postoculars and one subocular, separating the eye from the labials; loreal pit separated from the labials; 7 to 9 upper labials. Scales smooth, in 21 rows. Ventrals 138–159; anal entire; subcaudals 33–54 pairs. Reddish, greyish, or pale brown above, with large angular, dark brown, black-edged spots disposed in opposite pairs or alternating; a dark brown vertebral line; lips yellowish or pink, powdered with brown; a broad dark brown, black-edged band, festooned below, from the eye to the angle of the mouth, with a light band above it; yellowish beneath, uniform or powdered or spotted with greyish brown.

Total length 810 millim.; tail 90.

Siam, Malay Peninsula, Java.

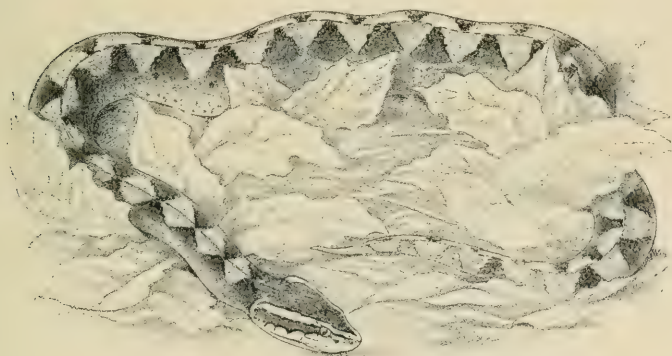


Fig. 64.—*Ancistrodon rhodostoma*.

This handsome snake, somewhat suggestive of a Python in its markings, was long known from Java only, where it is regarded as one of the most dangerous poisonous snakes, cases being known of men dying five minutes after being bitten. In the neighbourhood of Biserat and Kuala Jalor, where it was discovered by Messrs. Annandale and Robinson, and does not seem to be at all uncommon, the natives do not believe its bite to be fatal. It lies

about among dead leaves and is very sluggish. The Jalor Malays call it *Ular kapak daun*, or "leaf axe-snake." It feeds on frogs and mammals. The species occurs also on the island of Junk Ceylon or Selanga, off the west coast of the Malay Peninsula, south of the isthmus of Kra.

Genus **LACHESIS.**

Daudin, Hist. Rept. v, p. 349 (1803).

Pupil vertical. Upper surface of head covered with scales or small shields. Body cylindrical or compressed; scales smooth or



Fig. 65.—Head of *Lachesis monticola*.

keeled, with or without apical pits. Tail moderate or short; subcaudals in two rows (or single).

South-Eastern Asia, Central and South America.

Six species in the Malay Peninsula.

Synopsis of the Species.

I. Scales between the eyes smooth or obtusely keeled; gular scales smooth.

A. Snout not prominent, not raised above the nostrils.

Supraocular shields large, separated on the vertex by 5 to 8 series of scales; scales smooth or feebly keeled, in 21 to 25 (rarely 27) rows; ventrals 132-158; tail not prehensile

L. monticola, p. 215.

Supraoculars very narrow if distinct, separated by 12 to 15 series of scales; scales strongly keeled, in 25 or 27 rows; ventrals 160-182; tail slightly prehensile

L. purpureomaculatus, p. 216.

Supraoculars narrow if distinct, separated by 8 to 13 series of scales; scales nearly smooth or more or less distinctly keeled, in 19 to 23 rows; ventrals 150-175; tail prehensile . . .

L. gramineus, p. 217.

Supraoculars large, separated by 4 to 9 series of scales; scales feebly keeled, in 21 rows; ventrals 180-191; tail prehensile

L. sumatranus, p. 217.

B. Snout very prominent, the upper edge strongly raised above the nostrils; scales in 19 or 21 rows; ventrals 152-168; tail prehensile

L. borneensis, p. 218.

II. Scales between the eyes strongly keeled; gular scales obtusely keeled; scales in 21 to 25 (rarely 19 or 27) rows; ventrals 127-154; tail prehensile

L. wagleri, p. 218.

233. *Lachesis monticola*.

Trimeresurus monticola, Günth. Rept. Brit. Ind. p. 388, pl. xxiv, fig. B (1864); Fayrer, Thanatoph. Ind. pl. xv (1874); Bouleng. Faun. Brit. Ind., Rept. p. 426 (1890).

Trimeresurus convictus, Stoliczka, Journ. Asiat. Soc. Bengal, xxxix, p. 224, pl. xii, fig. 1 (1870).

Lachesis monticola, Bouleng. Cat. Sn. iii, p. 548 (1896).

Malay name, *Ular kapar*.

Snout very short; eye very small. Rostral as deep as broad or a little broader than deep; upper head-scales small, subimbricate, smooth; supraocular large; 5 to 8 scales in a transverse line between the supraoculars; 3 or 4 rows of scales between the eye and the labials; 8 or 9 upper labials, second usually forming the anterior border of the loreal pit. Scales feebly keeled or nearly

smooth, in 21 to 25 (rarely 27) rows. Ventrals 132-158; anal entire; subcaudals 21-57 pairs. Tail not prehensile. Brown or yellowish above, with one or two dorsal series of large squarish dark brown spots, and a lateral series of smaller spots; head dark brown above, pale brown or yellowish on the sides, with a dark brown temporal streak; lower parts whitish, powdered or spotted with brown, the brown spots sometimes confluent into two stripes.

Total length 740 millim.; tail 115.

Tibet, Himalayas, hills of Assam, Burma, and the Malay Peninsula, Sumatra. Recorded from Penang and Singapore, and known from the Larut Hills, Perak. The type-specimen of Stoliczka's *T. convictus* was found near the top of the western hill of Penang (about 2400 feet), and was stepped upon by an old convict coolie, who was bitten in the left foot. The man sucked his wound, and was given some brandy, and escaped from the accident without any ill effects, without even a swelling of the foot. *L. monticola* is one of the few Viperine snakes which lays eggs instead of being ovoviviparous, some 10 eggs forming a cluster (cf. G. A. Miller, Journ. Nat. Hist. Soc. Bombay, xv, p. 729, 1904).

234. *Lachesis purpureomaculatus*.

Trigonocephalus purpureomaculatus, Gray, Ill. Ind. Zool. i, pl. lxxxii (1832).

Trigonocephalus puniceus (non Reinw.), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1043 (1847).

Trimeresurus carinatus, Günth. Rept. Brit. Ind. p. 386 (1864); Fayrer, Thanatoph. Ind. pl. xiii (1874).

Trimeresurus purpureus, Günth. op. cit. p. 387.

Trimeresurus purpureomaculatus, Bouleng. Faun. Brit. Ind., Rept. p. 429 (1890).

Lachesis purpureomaculatus, Bouleng. Cat. Sn. iii, p. 553 (1896); S. Flower, P. Z. S. 1896, p. 896; Ridley, Journ. Straits Branch Roy. Asiat. Soc. no. 32, 1899, p. 203.

Rostral as deep as broad; upper head-scales very small, juxtaposed, convex or obtusely keeled; supraocular very narrow, sometimes broken up into scales; 12 to 15 scales in a transverse line between the supraoculars; 2 or 3 small postoculars and a subocular, which is separated from the labials by 2 or 3 series of scales; 11 to 13 upper labials, fourth and succeeding small, first usually fused with the nasal, second usually forming the anterior border of the loreal pit. Scales strongly keeled, in 25 or 27 rows. Ventrals 160-182; anal entire; subcaudals 55-76 pairs. Tail slightly prehensile. Dark purplish brown or blackish, uniform or variegated with pale green; flanks usually pale green or spotted with pale green; olive or greenish white below, uniform or spotted with black; some specimens uniform green.

Total length 980 millim.; tail 150.

Eastern Himalayas, Bengal, Assam, Burma, Andamans, Nicobars, Malay Peninsula, Sumatra. Recorded from Penang and Singapore, and very common on the small islands round the Malay Peninsula, but rarely if ever met with on the mainland. On Singapore, according to Ridley, it seems always to reside on the sea-shore, hiding under rocks or basking in the sun.

235. *Lachesis gramineus*.

Coluber gramineus, Shaw, Zool. iii, p. 420 (1802).

Trigonocephalus gramineus, part., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1040 (1847).

Trimeresurus gramineus, Günth. Rept. Brit. Ind. p. 385 (1864); Bouleng. Faun. Brit. Ind., Rept. p. 429 (1890).

Trimeresurus erythrurus, Günth. op. cit. p. 386.

Lachesis gramineus, Bouleng. Cat. Sn. iii, p. 554 (1896); S. Flower, P. Z. S. 1899, p. 695; Wall, Journ. Nat. Hist. Soc. Bombay, xvi, p. 536, pl. i, figs. 1-4 (1905).

Snout without distinct canthus. Rostral as deep as broad or a little broader than deep; upper head-scales small, smooth, imbricate or subimbricate, 8 to 13 in a transverse series between the supraoculars, which are narrow (rarely divided); 2 or 3 postoculars and a subocular; usually 1 or 2 (rarely 3) series of scales between the subocular and the labials; 8 to 12 upper labials, second forming the anterior border of the loreal pit, third largest. Scales in 21 (rarely 19 or 23) rows, smooth or more or less distinctly keeled. Ventrals 150-175; anal entire; subcaudals 52-75 pairs. Tail prehensile. Bright green above, rarely olive or yellowish, with or without ill-defined blackish cross-bands; usually a light, white or yellow streak along the outer row of scales; end of tail often yellow or red; lower parts green, yellow, or whitish.

Total length 870 millim.; tail 150.

Himalayas, Bengal, and Southern China to Malay Peninsula and Archipelago. Generally distributed, and common in most parts of the Peninsula.

It is usually found on bushes or trees, often concealed in the dense foliage; feeds on small mammals, lizards, birds, and frogs and toads. Its bite is considered as not very dangerous. It produces 7 to 12 young.

236. *Lachesis sumatranus*.

Coluber sumatranus, Raffles, Tr. Linn. Soc. xiii, p. 334 (1822).

Lachesis sumatranus, Bouleng. Cat. Sn. iii, p. 557 (1896).

Head rather elongate. Rostral as deep as broad or a little broader than deep; upper head-scales rather large, flat, smooth, imbricate or subimbricate, largest on the snout, 4 to 9 in a transverse series between the supraoculars, which are large; 2 or 3 postoculars and a subocular, which is in contact with the third or

third and fourth labials; 9 to 11 upper labials, second forming the anterior border of the loreal pit, third largest. Scales in 21 rows, feebly keeled. Ventrals 180-191; anal entire; subcaudals 58-82 pairs. Tail prehensile. Bright green above, the scales usually black-edged, with or without black cross-bands; two series of small whitish spots may be present along the back; a more or less distinct whitish or yellow streak usually present on each side, along the outer row of scales; ventrals yellowish or green, with or without fine black edges; end of tail red.

Total length 1100 millim.; tail 180.

Sumatra, Borneo, Palawan. Specimens stated to be from Singapore were presented to the British Museum by Dr. Dennys; and in Selangor and Perak and Pahang it is fairly abundant at elevations of 2000-3000 feet, especially where there is much bamboo-jungle.

237. *Lachesis borneensis*.

Atropophis borneensis, Peters, Ann. Mus. Civ. Genova, iii, p. 41 (1871).

Lachesis borneensis, Bouleng. Cat. Sn. iii, p. 561 (1896).

Snout short, obliquely truncate, with sharp, raised canthus most developed above the nasal shields. Rostral as deep as broad; upper head-scales small, juxtaposed or subimbricate, smooth on snout and vertex; 9 to 11 scales in a transverse series between the supraocular shields, which are narrow or broken up into scales; 2 or 3 rows of scales between the eye and the labials; 10 to 12 upper labials, second forming the anterior border of the loreal pit, third largest. Scales in 19 or 21 rows, dorsals feebly and obtusely keeled. Ventrals 152-168; anal entire; subcaudals 43-65. Tail prehensile. Greyish or reddish brown above, with more or less distinct darker spots, which may be edged with blackish; a light, dark-edged streak on each side of the head, behind the eye; belly profusely powdered with brown, or brown with a lateral series of yellowish-white spots; end of tail red or reddish.

Total length 770 millim.; tail 105.

Originally described from Borneo, this snake has since been rediscovered in Sumatra and, by Mr. L. Wray, at Merak in the Perak Hills, at an altitude of 3000 feet. Mr. A. J. B. Butcher has recently presented to the State Museum a specimen obtained at Ayer Itam, Selangor.

238. *Lachesis wagleri*.

Cophias wagleri, Boie, Isis, 1827, p. 561.

Trigonocephalus sumatranus (non Raffles), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1042, pl. xl, fig. 9 (1847).

Trimeresurus wagleri, Günth. Rept. Brit. Ind. p. 388 (1864).

Lachesis wagleri, Bouleng. Cat. Sn. iii, p. 562 (1896) ; S. Flower, P. Z. S. 1899, p. 696 ; Ridley, Journ. Straits Branch Roy. Asiat. Soc. No. 32, 1899, p. 202.

Malay name, *Ular bakaw* (Mangrove-snake).

Head very broad, little longer than broad ; snout very short, with more or less distinct canthus ; eye very small. Rostral as deep as broad or a little broader than deep ; upper head-scales small, strongly imbricate, keeled ; 7 to 13 scales in a series between the supraoculars, which are usually narrow or broken up into scales ; 1, 2, or 3 postoculars and a subocular, which is separated from the labials by one or two series of scales, rarely in contact with the third labial ; 8 to 10 upper labials, second not entering the loreal pit, third very large ; gular scales obtusely keeled. Scales in 21 to 25 rows (rarely 19 or 27), more or less distinctly keeled. Ventrals 1²⁷ 154 ; anal entire ; subcaudals 45-55 pairs. Tail prehensile. Adults usually green above, the scales black-edged, with bright yellow, black-edged cross-bands, or black with yellow cross-bands ; head black, spotted with yellow ; belly bright yellow or yellow and green, the shields black-edged ; end of tail black. Young green above, with yellow or white cross-lines edged behind with blue or purple, or with two dorsal series of small spots or cross-bars of the same colour ; a yellow or white line on each side of the head, passing through the eye, edged below with blue or purple ; belly white or pale green, with or without black edges to the shields ; end of tail usually red or reddish brown. Iris yellow.

Total length 980 millim. ; tail 150.

Malay Peninsula and Archipelago. Generally distributed in the Peninsula, and common in Singapore. Lives both on the ground and on trees. Feeds on mammals, birds, and lizards. When annoyed, Ridley says, it opens its mouth exceedingly wide, showing its poison-fangs, but it is very slow and stupid, creeping away in a leisurely manner. It is quite gentle in captivity. Its bite does not seem to be deadly for large animals.

The commonest of its genus in the Malay Peninsula, but not as a rule far from the coast ; exceedingly abundant in the mangrove-belt, where the Chinese fuel-cutters are often bitten, without, however, any very serious results.

ADDENDUM TO COLUBRIDÆ.

The description of the following Snake was inadvertently omitted from p. 157:—

171 *a.* ***Calamaria gimletti*.**

Bouleng. Ann. & Mag. Nat. Hist. (7) xv, 1905, p. 456.

Rostral as deep as broad, its upper portion as long as its distance from the frontal, which is as broad as long, and 3 to $3\frac{1}{2}$ times as broad as the very small supraocular; no præocular; a very small postocular; eye $\frac{1}{2}$ to $\frac{2}{3}$ as long as its distance from the mouth; 4 upper labials, second and third entering the eye; first pair of lower labials forming a suture behind the symphysial; two pairs of chin-shields in contact with each other. Scales in 13 rows. Ventrals 202–239; anal entire; subcaudals 11–17. Tail rounded at the end. Reddish brown above and on the outer ends of the ventrals, which are otherwise white; a pair of yellowish-white dorsal spots on the base of the tail; a brown line in the middle of the lower surface of the tail.

Total length 175 millim.; tail 13.

The type specimen was obtained in Kelantan by Dr. Gimlette. I have examined a second specimen, the locality of which is unknown, but Mr. Kloss assures me there can be no doubt as to its having been procured in some part of the Malay Peninsula.

Class **BATRACHIA.**

Cold-blooded Vertebrates usually breathing by gills during at least part of their existence, undergoing metamorphoses *. In the recent forms, body naked or with scales imbedded in the skin, and skull with a large parasphenoid, devoid of supraoccipital and basioccipital, and articulating with the vertebral column by two condyles. Paired limbs as in the higher Vertebrates, pentadactyle or derivable from the pentadactyle type.

Represented in the Fauna here dealt with by two Orders :--

I. **ECAUDATA**, Frogs and Toads.

II. **APODA**, Cæcilians.

Order **ECAUDATA.**

Four limbs and no tail. Radius and ulna and tibia and fibula confluent; tarsus (astragalus and calcaneum) elongate, forming an additional segment in the hind limb. Frontal bones confluent with parietals, nasals with præfrontals.

The body is short, the dorsal vertebral column consisting of but eight præsacral vertebræ (exceptionally still further reduced), and the coccygeal vertebræ are confluent into a single styloid bone.

* The young of certain species leave the egg or the body of their mother in the perfect condition, thus dispensing with the metamorphosis.

The young usually pass through lengthy metamorphoses, in the principal aquatic stages of which they are known as "tadpoles." In the tadpoles the head and body are globular, with internal gills, limbs are absent and a tail is present; the hind and fore limbs appear successively, the tail is gradually absorbed, and the gills disappear, after which last transformation the young leaves the water.

The eggs and early development are essentially similar to those of fishes, and quite unlike those of Reptiles. In many the eggs are small, very numerous, and deposited in water. But in others the eggs are large, with large vitelline mass, and the young pass rapidly through part or all of the metamorphoses within the egg capsule, emerging as advanced larvæ or even as perfect lung-breathing frogs. Much remains to be done in observing the breeding habits and development of the Malayan Batrachians.

Tailless Batrachians occur all over the world wherever insect food is procurable. Representatives of four families are found in the Malay Peninsula.

Series A. *FIRMISTERNIA*.

Coracoid firmly united by the epicoracoid cartilage; præcoracoids, if present, each resting with its distal extremity upon the coracoid, or connected with the latter by the epicoracoid cartilage. (See fig. 66.)

Upper jaw toothed; diapophyses of sacral vertebra cylindrical	<i>Ranidæ</i> , p. 223.
Jaws toothless; diapophyses of sacral vertebra dilated	<i>Engystomatidæ</i> , p. 257.

Series B. *ARCIFERA*.

Coracoids and epicoracoids connected by an arched cartilage (the epicoracoid), that of the one side overlapping that of the other. (See fig. 74, p. 267.)

Jaws toothless; diapophyses of sacral vertebra dilated	<i>Bufonidæ</i> , p. 267.
Upper jaw toothed; diapophyses of sacral vertebra strongly dilated	<i>Pelobatidæ</i> , p. 276.

Series A. FIRMISTERNIA.

Family RANIDÆ.

Upper jaw toothed; diapophyses of sacral vertebra not dilated.

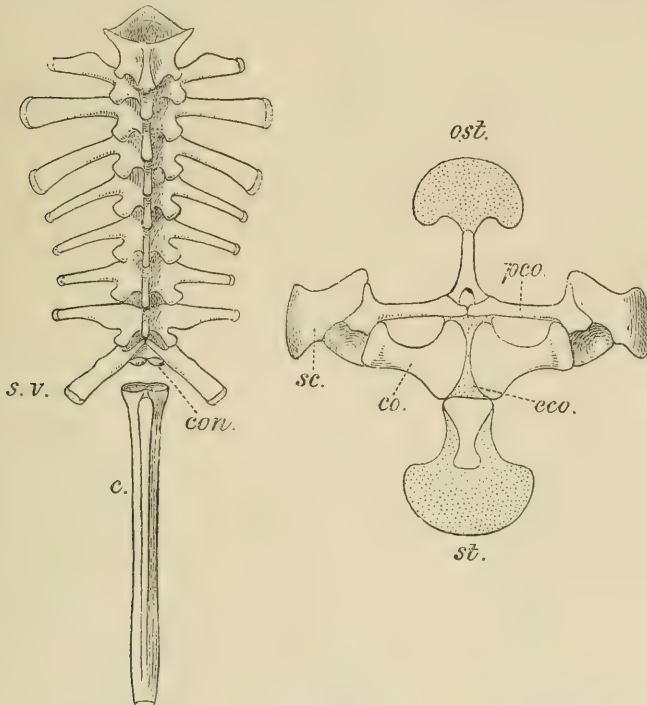


Fig. 66.—Vertebral column and pectoral arch of *Rana tigrina*.

<i>c.</i> Coccyx.	<i>eco.</i> Epicoracoid.	<i>sc.</i> Scapula.
<i>co.</i> Coracoid.	<i>ost.</i> Omosternum.	<i>st.</i> Sternum.
<i>con.</i> Sacral condyles.	<i>pco.</i> Præcoracoid (+clavicle).	<i>s.v.</i> Sacral vertebra.

Cosmopolitan, except the greater part of Australia.
Four genera in the Malay Peninsula.

Synopsis of the Genera.

1. No intercalary ossification between the distal and penultimate phalanges; extremity of penultimate phalanx not sharply defined externally (see fig. 67, 1); digits perfectly free.

Tongue entire; vomerine teeth none OXYGLOSSUS, p. 224.

Tongue deeply emarginate and bifid behind;
vomerine teeth present RANA, p. 226.

II. An intercalary ossification between the
distal and penultimate phalanges; ex-
tremity of penultimate phalanx sharply
defined externally (see fig. 67, 2); tongue
deeply emarginate and bifid behind.

Vomerine teeth present RHACOPHORUS, p. 247.
Vomerine teeth none IXALUS, p. 252.

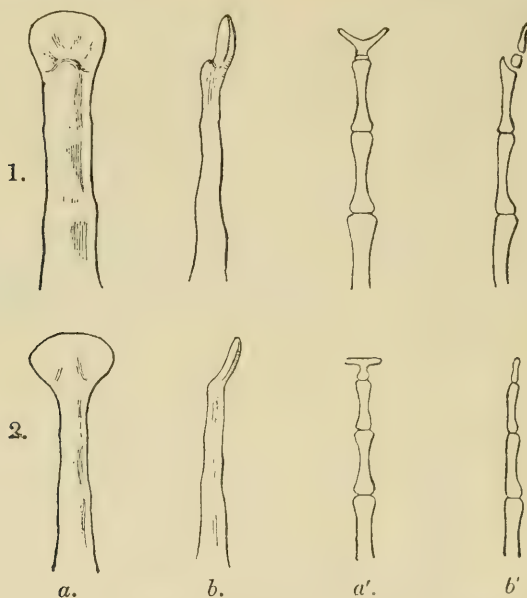


Fig. 67.—1. Finger of *Rhacophorus maximus*. 2. Finger of *Rana latopalmata*.
(P. Z. S. 1888, p. 206.)
a. Upper view. b. Side view. a', b'. Skeleton.

Genus OXYGLOSSUS.

Tschudi, N. Class. Batr. p. 85 (1838).

Pupil horizontal. Tongue narrow, entire and free behind.

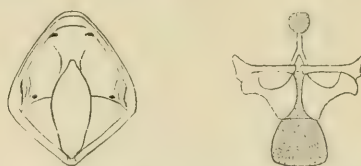


Fig. 68.—*Oxyglossus lima*. Open mouth and pectoral arch.

Vomerine teeth none. Tympanum indistinct. Fingers free, toes

webbed, the tips not dilated into regular disks. Outer metatarsals separated by web. Omosternum with a bony style; sternum a cartilaginous plate.

Southern China and Bengal to the Malay Archipelago.

Two species:—

Tongue pointed behind; toes pointed; belly warty . . . *O. lima*, p. 225.

Tongue rounded behind; tips of toes dilated; belly
smooth *O. lævis*, p. 225.

239. *Oxyglossus lima*.

Rana lima, Gravenh. Delic. Mus. Zool. Vratisl. p. 41 (1829).

Oxyglossus lima, Tschudi, l. c.; Günth. Rept. Brit. Ind. p. 401 (1864); Bouleng. Cat. Batr. Ecaud. p. 5 (1882); id. Faun. Brit. Ind., Rept. p. 436 (1890); S. Flower, P. Z. S. 1899, p. 886; Laidlaw, P. Z. S. 1900, p. 884; Bouleng. Fascic. Malay., Zool. i, p. 134 (1903).

Tongue elongate, extensively free and pointed behind. Habit stout. Head small; snout rather pointed, without canthus rostralis; interorbital space very narrow, much narrower than the upper eyelid. Fingers rather slender, acutely pointed, first not extending beyond second; toes pointed, fourth not very much longer than third and fifth, very broadly webbed; subarticular tubercles very small; two metatarsal tubercles, inner the larger and oval, outer subconical; a short tarsal fold and a small tarsal tubercle just below the tibio-tarsal articulation. The tarso-metatarsal articulation reaches the tip of the snout. Skin warty, the warts most numerous and of unequal size on the back, largest and forming more or less symmetrical rows on the throat and belly. Greenish brown above, with small darker markings; sometimes a light (yellow or green) vertebral stripe; yellow beneath, with a dark brown band on the arm and along the hinder side of the thigh, and sometimes a brown L-shaped mark on each side at the base of the thighs; sometimes a brown band on each side from the chin to the breast. Iris brown, with a narrow gold line round the pupil. Male with an internal vocal sac.

From snout to vent 33 millim.

From Bengal and Southern China to the Malay Archipelago.

Locally distributed in the Malay Peninsula. Recorded from Kedah, Jalor, and Patani.

A thoroughly aquatic frog, found in small ponds, often indistinctly brackish water.

Called "Katak lempung" by the Malays of Kedah.

240. *Oxyglossus lævis*.

Günth. Cat. Batr. Sal. p. 7, pl. i, fig. A (1858); Bouleng. Cat. Batr. Ecaud. p. 6 (1882); id. Faun. Brit. Ind., Rept. p. 437 (1890); S. Flower, P. Z. S. 1896, p. 897; Bouleng. P. Z. S. 1897, p. 228; Laidlaw, P. Z. S. 1900, p. 884.

Tongue oval, rounded behind, free in the posterior third or

fourth. Head small; snout rounded, without canthus rostralis; interorbital space narrower than the upper eyelid. Fingers short, with blunt tips, first not or but slightly extending beyond second; toes entirely or nearly entirely webbed, the web more emarginate than in *O. lima*, the tips swollen into small disks; subarticular tubercles small; inner metatarsal tubercle elliptic, compressed; outer metatarsal tubercle absent or very indistinct; a short tarsal fold. The tarso-metatarsal articulation reaches the tip of the snout, or a little beyond. Skin smooth, or with small smooth warts. Brownish above, with or without rather indistinct darker spots; sometimes a light vertebral line; a light streak from the eye to the commissure of the mouth often conspicuous; hind limbs with rather irregular dark cross-bands; lower parts whitish, throat often speckled with brown. Male with an internal vocal sac.

From snout to vent 40 millim.

The tadpole is remarkable for the small mouth, with horseshoe-shaped lip without horny teeth, the closed mouth appearing as a vertical slit; a black horny beak; eyes on upper surface; spiraculum sinistral, anus median; tail acutely pointed, with low crests, more than twice as long as body. Olive above, white beneath, tail speckled with dark brown. Total length 51 millim.

Burma, Siam, Malay Peninsula (Perak, Jalor) and Archipelago.

Genus **RANA**.

Linn. Syst. Nat. i, p. 354 (1766).

Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth. Tympanum distinct or hidden. Fingers free,

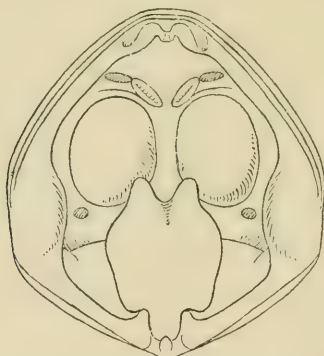


Fig. 69.—Open mouth of *Rana macrodon*.

toes webbed, with simple or dilated tips. Outer metatarsals separated by web. Omosternum and sternum with a bony style. Distal phalanges obtuse or T-shaped.

Cosmopolitan, except in the Southern parts of South America, in Australia and New Zealand.

Some species are chiefly terrestrial, others aquatic, others arboreal. Arboreal habits are usually to be recognized by the distal enlargement of the digits, although some strictly aquatic forms, such as *R. kuhlii*, have the toes ending in small but very distinct disks.

This genus is represented by 22 species in the Malay Peninsula.

Synopsis of the Species.

- I. No glandular dorso-lateral fold*; digits with the tips not or but feebly dilated.
 - A. Toes acutely pointed, very broadly webbed; inner metatarsal tubercle conical *R. cyanophlyctis*, p. 228.
 - B. Toes blunt or with dilated tips.
 - 1. Tympanum indistinct or hidden; toes at least $\frac{2}{3}$ webbed.
 - Tibio-tarsal articulation not reaching beyond eye; tympanum hidden *R. kuhlii*, p. 229.
 - Tibio-tarsal articulation to between eye and tip of snout; tympanum scarcely distinct.. *R. laticeps*, p. 230.
 - 2. Tympanum very distinct.
 - a. Vomerine teeth commencing on a line with the hinder edge of the choanæ; tips of fingers and toes dilated into small disks.
 - Toes nearly entirely webbed; skin smooth or with irregular glandules on the back..... *R. doriae*, p. 231.
 - Toes $\frac{2}{3}$ to $\frac{3}{4}$ webbed; skin of back with regular longitudinal folds *R. plicatella*, p. 231.
 - Toes $\frac{1}{3}$ to $\frac{1}{2}$ webbed; no dorsal folds *R. hascheana*, p. 232.
 - b. Vomerine teeth between the choanæ, or commencing from the anterior corner of the latter.
 - a. Tips of fingers not dilated.
 - Toes broadly webbed, with distinctly swollen tips; skin smooth above, or with small warts *R. macrodon*, p. 233.
 - Toes broadly webbed, obtuse; skin warty, the warts usually forming longitudinal folds *R. tigrina*, p. 234.
 - Toes half webbed; skin warty, the warts usually forming longitudinal folds *R. limnocharis*, p. 236.
 - β. Tips of fingers and toes dilated into small disks.
 - Toes $\frac{1}{2}$ to $\frac{2}{3}$ webbed; first finger much longer than second; back with flat warts, at least on the sides *R. glandulosa*, p. 236.

* Except in young *R. macrodon*.

- Toes $\frac{2}{3}$ webbed; first finger much longer than second; back smooth or finely granulate *R. signata*, p. 237
- Toes not $\frac{1}{2}$ webbed; first finger a little longer than second; back smooth *R. luctuosa*, p. 238.
- II. A glandular fold along each side of the back; tympanum very distinct; digits more or less dilated at the end.
- A. Web not reaching the disks of the third and fifth toes.
- Toes half webbed, very slender; foot nearly as long as the distance between tympanum and vent. *R. macrodactyla*, p. 238.
- Toes $\frac{2}{3}$ webbed; foot about half length of head and body; two small metatarsal tubercles; first finger not extending much beyond second *R. nicobariensis*, p. 240.
- Toes $\frac{3}{5}$ webbed; a large compressed inner metatarsal tubercle; first finger much longer than second *R. lateralis*, p. 239.
- B. Web reaching the disks of the third and fifth toes.
1. Disks of fingers small; glandular lateral fold broad.
- No outer metatarsal tubercle; first finger not extending beyond second. *R. erythræa*, p. 241.
- A small outer metatarsal tubercle; first finger extending beyond second. *R. nigrovittata*, p. 242.
2. Disks of fingers large; glandular lateral fold narrow.
- First finger not extending as far as second; tibio-tarsal articulation reaching end of snout or a little beyond *R. labialis*, p. 242.
- First finger extending as far as second; tibio-tarsal articulation reaching a little beyond end of snout *R. hosii*, p. 243.
- First finger extending as far as second; tibio-tarsal articulation reaching far beyond end of snout *R. jerboa*, p. 244.
- III. Glandular lateral fold absent or feeble and interrupted; digits dilated into very large disks.
- First finger a little longer than second; tympanum about half diameter of eye *R. livida*, p. 245.
- First finger shorter than second; tympanum $\frac{1}{2}$ diameter of eye *R. larutensis*, p. 245.

241. *Rana cyanophlyctis*.

Schneid. Hist. Amph. i, p. 137 (1799); Günth. Rept. Brit. Ind. p. 406 (1864); Bouleng. Cat. Batr. Ecaud. p. 17 (1882); id. Faun. Brit. Ind. p. 442 (1890).

Rana leschenaultii, Dum. & Bibr. Erp. Gén. viii, p. 342 (1841); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1059 (1847).

Vomerine teeth in two small oblique series extending a little beyond the hinder edge of the choanæ. Head moderate; snout

scarcely pointed; canthus rostralis indistinct; interorbital space much narrower than the upper eyelid; tympanum distinct, about $\frac{2}{3}$ the size of the eye. Fingers slender, pointed, first not extending beyond second; toes webbed to the tips, which are pointed, fourth not much longer than third or fifth; outer toe strongly fringed; subarticular tubercles small; inner metatarsal tubercle conical, much like a rudimentary toe. Tibio-tarsal articulation usually reaching a little beyond eye. Skin with small tubercles and warts above, and with rows of pores. Brown or olive above, dark spotted or marbled; two blackish streaks on the hinder side of the thighs, seldom absent; beneath often speckled with blackish. Male with two external vocal sacs, opening by two slits beneath the angles of the mouth.

From snout to vent 97 millim.

The tadpole (described and figured by J. Anderson, P. Z. S. 1895, pl. xxxvii, fig. 2) grows to a length of over 100 millim. The mouth is furnished with a strong, entirely black beak, surrounded by a large circular lip with a single marginal series of upper horny teeth, and two lower series, and with large subconical papillæ on the sides. Spiraculum sinistral, anus dextral. Tail pointed, about $1\frac{1}{2}$ times the length of the body, with high dermal folds or crests, the upper of which extends on the back to the vertical of the spiraculum; it is largely blotched with black.

This species is common in South Arabia, Baluchistan, India and Ceylon. The only authority for its occurrence in the Malay Peninsula, which I think doubtful, is Cantor, who adds, "the species is apparently not numerous." Two specimens from Cantor's Collection, labelled as from Penang, are in the British Museum.

A thoroughly aquatic frog, well known in India for its curious habit, probably shared by the allied *R. hexadactyla*, of making leaps over the surface of the water, alighting on all fours and starting again as they would on land. Capt. Flower has observed it in India to sometimes make a dozen leaps before going under the surface.

242. *Rana kuhlii*.

Dum. & Bibr. Erp. Gén. viii, p. 384 (1841); Günth. Rept. Brit. Ind. p. 404 (1864), part.; Bouleng. Cat. Batr. Ecaud. p. 443 (1882); id. Faun. Brit. Ind. p. 443 (1890); S. Flower, P. Z. S. 1899, p. 887; A. L. Butler, Journ. Nat. Hist. Soc. Bomb. xv, p. 195 (1903).

Vomerine teeth in two small oblique series behind the choanæ; lower jaw with two more or less developed tooth-like prominences in front. Head moderate in females, very large in males; snout short, rounded, without canthus rostralis; eyes prominent, directed upwards; interorbital space as broad as or a little broader than the upper eyelid; tympanum hidden. Fingers moderate, blunt, first and second equal, or first extending a little beyond second; toes broadly webbed, sometimes to the tips, which are

dilated into small disks; subarticular tubercles well developed; inner metatarsal tubercle narrow, blunt, about $\frac{2}{3}$ length of inner toe; no outer tubercle; a tarsal fold. Tibio-tarsal articulation reaching temple or eye. Above with short longitudinal glandular folds or roundish tubercles, sometimes nearly smooth, except upon the tibia. Brown or olive-green above, with or without irregular small black spots; a black transverse line or bar, preceded by a yellowish one, often present between the eyes; sometimes a yellow vertebral stripe; chin and sides of head, body, and limbs yellow; lips and limbs mottled or spotted with dark olive-brown; lower parts buff. Iris bronze with a black cross, and a narrow gold rim round the pupil. Male without vocal sacs.

From snout to vent 90 millim.

Southern China, Formosa and Loo Choo Islands to Malay Peninsula. Found in the Larut Hills, Perak, up to 4500 feet altitude, also on the hills of Selangor and Negri Sembilan, but nowhere common.

Thoroughly aquatic.

243. *Rana laticeps*.

Bouleng. Cat. Batr. Ecaud. p. 20, pl. i, fig. 1 (1882); id. Faun. Brit. Ind., Rept. p. 444 (1890); S. Flower, P. Z. S. 1896, p. 897.

Vomerine teeth in two oblique oval groups behind the level of the choanæ; lower jaw with two bony prominences in front, acute and directed backwards in the adult male. Head large, triangular, especially in the male; snout short, subacuminate, with rounded canthus rostralis; interorbital space broader than the upper eyelid; tympanum scarcely distinct, $\frac{2}{3}$ the size of the eye. Fingers moderate, blunt, first not extending beyond second; toes moderate, $\frac{2}{3}$ to nearly entirely webbed, the tips dilated into very small disks; a tarsal fold; subarticular tubercles well developed; inner metatarsal tubercle elongate, blunt, $\frac{2}{3}$ length of inner toe; no outer tubercle. Tibio-tarsal articulation reaching to between eye and end of snout. Upper parts with small elongate warts and rounded tubercles; a fold above the tympanum. Brown above, indistinctly marbled with darker; a light, dark-edged cross-band between the upper eyelids and usually a Λ -shaped dark marking on the back; limbs more or less distinctly cross-barred; throat often spotted with brown. Male without vocal sacs.

From snout to vent 53 millim.

Bengal, Khasi Hills, and Malacca. Recorded by Hanitsch (Rep. Raffles Libr. & Mus. 1898) from Gunong Kledang, Ipoh, Perak, 2000 feet. Specimens from that locality, collected by Dr. Hanitsch, are preserved in the British Museum.

244. *Rana doriæ*.

Bouleng. Ann. Mus. Civ. Genova (2) v, p. 482, pl. viii, fig. 1 (1887); id. Faun. Brit. Ind., Rept. p. 447 (1890); id. Ann. Mus. Civ. Genova (2) xiii, p. 328 (1893); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 196 (1904).

Vomerine teeth in two oblique oval groups commencing on a line with the hinder edge of the choanæ; lower jaw with or without bony prominences. Head moderate in females, very large in full-grown males; snout short, obtuse; canthus rostralis obtuse; interorbital space as broad as the upper eyelid, very convex in males; tympanum distinct, $\frac{2}{3}$ to once diameter of eye. Fingers moderate, first extending a little beyond second; toes moderate, nearly entirely webbed; a feeble cutaneous fringe along the outer side of the fifth toe; tips of fingers and toes dilated into small disks; subarticular tubercles moderate; inner metatarsal tubercle elongate, blunt, $\frac{2}{3}$ length of inner toe; no outer tubercle; a feeble tarsal fold. The tibio-tarsal articulation reaches the eye or the nostril. Skin smooth, or with irregular glandules on the back; a more or less distinct transverse fold connects the posterior borders of the eyes; a strong fold from eye to shoulder, above tympanum. Brown above, with small irregular darker spots; sometimes a yellowish vertebral stripe; a lighter cross-band between the eyes, bordered with darker behind; lips with vertical dark brown bars; hind limbs with rather irregular dark cross-bands; white beneath, uniform or scantily spotted with brown, throat of males spotted or marbled with brown or black. Male without vocal sacs.

From snout to vent 57 millim.

Originally described from Tenasserim, this frog has been rediscovered in Burma and in the Larut Hills, Perak, by Mr. L. Wray, and on the top of Bukit Timah, Singapore, by Mr. A. L. Butler.

245. *Rana plicatella*.

Stoliczka, Journ. Asiat. Soc. Bengal, xlii, p. 116, pl. xi, fig. 1 (1873); Bouleng. Cat. Batr. Ecaud. p. 26 (1882); S. Flower, P. Z. S. 1899, p. 890; Laidlaw, P. Z. S. 1900, p. 885; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 196 (1903).

Vomerine teeth in two oblique series converging behind, originating on a line with the hinder edge of the choanæ. Lower jaw with two fang-like bony prominences in front. Head large; snout bluntly pointed; canthus rostralis rounded; occiput swollen at the sides, interorbital region broader than the upper eyelid, convex and followed by a knob-like prominence; tympanum distinct, as large as or a little larger than the eye. Fingers moderate, first

slightly longer than second, the tips dilated into small but distinct disks; toes $\frac{2}{3}$ to $\frac{3}{4}$ webbed, the tips dilated like the fingers; subarticular tubercles well developed; inner metatarsal tubercle elongate, prominent; no outer tubercle; a very slight tarsal fold. The tibio-tarsal articulation reaches the tip of the snout or between the eye and the end of the snout. Skin of back with 8 or 10 longitudinal folds, sometimes with numerous small tubercles between them; a strong fold above the tympanum; upper eyelid tubercular. Bronze above, changing from bright yellowish red to dull brown shades, with or without a yellow vertebral line; some of the folds edged with black; a black chevron, pointing backwards, between the eyes; limbs with dark brown cross-bars; belly bright sulphur-yellow. Iris bronze, with a black cross, and a very narrow red ring round the pupil. Male without vocal sacs.

From snout to vent 40 millim.

Penang, Gunong Inas, between Kedah and Perak, up to 4000 feet above sea-level, and Bukit Timah, Singapore.

246. *Rana hascheana*.

Polypedates hascheanus, Stoliczka, Journ. Asiat. Soc. Beng. xxxix, p. 147, pl. ix, fig. 3 (1870).

Rana hascheana, W. Slater, P.Z.S. 1892, p. 344; S. Flower, P.Z.S. 1899, p. 894; Laidlaw, P.Z.S. 1900, p. 885; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 197 (1903).

Vomerine teeth in two oblique oval groups commencing on a line with the hinder edge of the choanæ. Head moderate; snout short, obtuse; canthus rostralis obtuse; interorbital space as broad as the upper eyelid; tympanum distinct, about $\frac{2}{3}$ the diameter of the eye. Fingers rather short, first and second equal or first slightly the longer, the tips scarcely dilated; toes moderate, $\frac{1}{3}$ to $\frac{1}{2}$ webbed, the tips dilated into small but very distinct disks; subarticular tubercles moderate; inner metatarsal tubercle elongate, blunt, $\frac{1}{2}$ to $\frac{2}{3}$ length of inner toe; no outer metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout, or between the eye and the tip of the snout. Skin smooth or with small flat warts or feeble corrugations; a strong fold from eye to shoulder, above tympanum. Rich yellow to orange brown above, in life, with dark brown spots; a dark brown cross-band between the eyes, edged with paler yellow in front, followed by a faint W-shaped mark, the ends of which begin behind the eyes; sides of body finely spotted with very dark brown and white; limbs with dark brown cross-bands; lower parts white, with pale purple and golden shades, and an interrupted line of dark brown spots across the throat.

From snout to vent 38 millim.

Common in the higher forests of Penang; also found in the Larut Hills, Perak, from 2000 to 3000 feet elevation, and on

Gunong Inas, between Kedah and Perak. Also known from the Natuna Islands. Mr. Butler observes that it croaks throughout the day, uttering a single very loud crow-like caw two or three times in succession and then remaining silent for some minutes. When tracked down the frog is almost always found under a dead leaf, not in a hole of any sort. It is extremely active and hard to catch, making off with long leaps through the undergrowth directly it is disturbed. In croaking, the throat is gently inflated.

247. *Rana macrodon*.

Dum. & Bibr. Erp. Gén. viii, p. 382 (1841); Blanf. P. Z. S. 1881, p. 225, pl. xxi, fig. 4; Bouleng. Cat. Batr. Ecaud. p. 24, pl. i, fig. 4 (1882); id. Faun. Brit. Ind., Rept. p. 448 (1890); S. Flower, P. Z. S. 1896, p. 898, pl. xlv, fig. 1, and 1899, p. 888; Laidlaw, P. Z. S. 1900, p. 885; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 196 (1903).

Rana fusca Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 719 (1855); Stoliczka, op. cit. xlii, p. 115 (1873).

Vomerine teeth in two long oblique series commencing from the inner front edges of the choanæ; lower jaw with two fang-like bony prominences in front, sometimes scarcely developed. Head large, occiput more or less swollen on the sides; snout rather pointed; canthus rostralis obtuse; interorbital space usually broader than the upper eyelid; tympanum distinct, usually smaller than the eye. Fingers moderate, obtuse, first much longer than second; toes broadly webbed, sometimes to the tips, which are feebly but distinctly dilated; subarticular tubercles well developed; inner metatarsal tubercle blunt, about $\frac{2}{3}$ the length of the inner toe; no outer metatarsal tubercle. The tibio-tarsal articulation reaches the eye or the tip of the snout. Skin smooth above, or with small rounded warts; upper eyelid tubercular; a strong fold above the tympanum; young with a narrow glandular fold on each side of the back. Olive-brown or green above, sometimes with a broad orange vertebral line; belly and lower surface of limbs pale orange. The larger variety found in Singapore is bright bronze, chocolate red, or pale yellowish or reddish, rarely olive-brown, usually with a narrow pale yellow vertebral stripe, and pale yellow beneath. Limbs more or less distinctly barred with dark brown, sometimes with a pale yellow line along the inner side of the tibia. Male without vocal sacs.

Total length 230 millim. One of the largest frogs known.

The tadpole, which measures only 37 millim., differs from that of *R. cyanophlyctis* in the upper caudal crest not extending forwards to the base of the tail. Sides and lower edge of the lip bordered with papillæ, the upper edge with a series of horny teeth, followed on each side by a short series; 3 series of teeth on the lower lip, first very short, weak and uninterrupted, second also uninterrupted, third longer and narrowly interrupted; beak broadly

edged with black. Above light reddish brown with a dark brown line through the eye; crests and posterior portion of muscular part of tail colourless, with irregular dark brown vertical bars.

Burma, Malay Peninsula and Archipelago. Recorded from Penang, Perak, Johore, Malacca, Singapore, from sea-level to 4000 feet on the hills.

Active frogs and good swimmers, called "Koldoo-ayer" by the Malays of Penang, and "Koldok-merah" at Singapore. Young specimens are usually known as *Katak umpan* or "bait-frogs" by the Peninsular Malays. According to Flower, their food consists of snails, crabs, insects and scorpions; they probably also feed on other frogs, and an instance is known of one swallowing a snake.

248. *Rana tigrina*.

Daud, Hist. Rain. Gren. Crap. p. 64, pl. xx (1802); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1060 (1847); Günth. Rept. Brit. Ind. p. 407 (1864); Bouleng. Cat. Batr. Ecaud. p. 26 (1882); id. Faun. Brit. Ind., Rept. p. 449, fig. 132 (1890); S. Flower, P. Z. S. 1896, p. 901, and 1899, p. 891, pl. lix, fig. 2; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 197 (1903).

Vomerine teeth in two long oblique series commencing from the inner front edges of the choanæ; lower jaw with two more or less distinct prominences in front in the adult. Head moderate; snout rounded or obtusely pointed, at least as long as the orbit; canthus rostralis obtuse; interorbital space narrower than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye. Fingers rather short, blunt, first extending beyond second; toes moderate, entirely or nearly entirely webbed; a membranous fringe along the outer side of the fifth toe; subarticular tubercles moderate; inner metatarsal tubercle oval or elliptical, blunt, $\frac{1}{2}$ to $\frac{2}{3}$ the length of the inner toe*; no outer metatarsal tubercle. The tibio-tarsal articulation reaches the eye. Skin of back with small warts and more or less distinct longitudinal folds; a more or less distinct fold across the head behind the eyes; a glandular fold above the tympanum. Brown, olive, or green above, usually with darker spots, with or without a yellowish vertebral line; back of thighs yellow, marbled with black; limbs with dark cross-bars. Iris dark brown, with a golden ring round the pupil. Male with two gular vocal sacs, forming folds on the sides of the throat, these regions generally blackish.

From snout to vent 160 millim.

The tadpole differs from that of *R. macrodon* in having 5 series of teeth in the upper lip, the first uninterrupted, and also 5 in the lower lip, the first short and uninterrupted, the second long and uninterrupted, the remainder broadly interrupted and very

* In the Malay specimens.

short; the large powerful beak is entirely black, the upper mandible has a single sharp cusp, the lower has two sharp cusps.



Fig. 70.—*Rana tigrina*.

Tail yellow, mottled with brown, with a dark line along the basal third of the muscular portion. Total length 52 millim.

India and Ceylon and Southern China to the Malay Peninsula and Archipelago. Known from Penang, Province Wellesley, Kedah, Patani, and Kelantan. Apparently very local, and far less common than the following species. Mr. Butler says that in three and a half years' collecting he has never met with it.

249. *Rana limnocharis*.

Wiegman. N. Acta Ac. Leop.-Carol. xvii, i, p. 255 (1835); Boulenger. Faun. Brit. Ind., Rept. p. 450 (1890), part.; S. Flower, P. Z. S. 1896, p. 901, and 1899, p. 893; Laidlaw, P. Z. S. 1900, p. 885; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 197 (1903); Boulenger. Spol. Zeyl. ii, p. 73 (1904).

Rana gracilis, (non Gravenh.), Wiegman. t. c. p. 257; Günther. Rept. Brit. Ind. p. 409 (1864); Boulenger. Cat. Batr. Ecaud. p. 28, part. (1882).

Vomerine teeth in two oblique series between the choanæ. Head moderate; snout more or less pointed, at least as long as the orbit; canthus rostralis obtuse; interorbital space narrower than the upper eyelid; tympanum very distinct, $\frac{3}{5}$ to $\frac{2}{3}$ the diameter of the eye. Fingers moderate, blunt, first extending beyond second; toes rather slender, half-webbed; subarticular tubercles moderate; inner metatarsal tubercle oval or elliptical, blunt, about half the length of the inner toe; a very small outer metatarsal tubercle. The tibio-tarsal articulation reaches the eye, or between the eye and the tip of the snout. Back warty, the warts often confluent into more or less regular longitudinal folds; a glandular fold above the tympanum. Brown or olive above, with darker spots or marblings, often with a yellow vertebral line or stripe; back of thighs yellow, marbled or reticulated with black; limbs with dark cross-bars; lips with dark bars; lower parts white, the sides of the throat black in the male, which is provided with vocal sacs as in the preceding species.

From snout to vent 65 millim.

The tadpole, described by H. S. Ferguson (Journ. Nat. Hist. Soc. Bombay, xv, 1903, p. 502, pl. A. fig. 3), is very different from that of *R. tigrina*, and resembles more that of *R. cyanophlyctis*. Beak black; upper lip with one row of teeth, on the edge; two uninterrupted series of lower labial teeth; papillæ present both on the sides and below. Body pinkish brown, tail lighter, with reddish brown markings throughout. Total length 37 millim.

India and Ceylon and China and Japan to the Malay Peninsula and Archipelago. Common and widely distributed in the Peninsula, often found in brackish water and tidal creeks and ditches. Together with *R. erythræa* the commonest rice-field frog.

250. *Rana glandulosa*.

Boulenger. Cat. Batr. Ecaud. p. 73, pl. vii (1882); id. Ann. & Mag. Nat. Hist. (6) viii, p. 291 (1891), and xiv, p. 87 (1894); S. Flower, P. Z. S. 1896, p. 905; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 200 (1903).

Vomerine teeth in two short oblique series between the choanæ. Head rather large; snout rounded, as long as the orbit, with

obtuse canthus rostralis and concave loreal region; nostril nearer end of snout than eye; interorbital space as broad as or slightly narrower than the upper eyelid; tympanum very distinct, $\frac{3}{5}$ to $\frac{3}{4}$ the diameter of the eye. Fingers rather elongate, first extending much beyond second; toes moderate, $\frac{1}{2}$ to $\frac{2}{3}$ webbed; tips of fingers and toes merely swollen, or dilated into very small disks; subarticular tubercles very prominent; a small oval inner metatarsal tubercle, and a smaller rounded one at the base of the fourth toe. The tibio-tarsal articulation reaches the eye, or between the eye and the tip of the snout. Back more or less distinctly granulate, with large flat glandules, at least on the sides. Olive-brown or reddish brown, spotted and speckled with blackish; lips dark, with large whitish spots or bars; limbs with dark cross-bars; lower parts whitish or buff, uniform or spotted with brown. According to Butler, the eye is of a conspicuous fiery red. Male with a vocal sac on each side of the throat, forming folds, and a large oval gland on the inner surface of the arm.

From snout to vent 95 millim.

Malay Peninsula (Pahang, Selangor, Malacca, Singapore), Borneo, Palawan. This is one of the creatures found in the Batu Caves in total darkness.

251. *Rana signata*.

Polypedates signatus, Günth. P. Z. S. 1872, p. 600, pl. xl, fig. C.

Rana signata, Bouleng. Cat. Batr. Ecaud. p. 71 (1882); Werner, Zool. Jahrb., Syst. xiii, p. 493 (1900); Laidlaw, P. Z. S. 1900, p. 886.

Rana obsoleta, Mocquard, N. Arch. Mus. (3) ii, p. 147 (1890).

Vomerine teeth in two small oblique groups between the choanæ. Head moderate; snout subacuminate, as long as or a little shorter than the orbit, with distinct canthus rostralis and concave loreal region; interorbital space as broad as the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye. Fingers slender, first extending a little beyond second; toes moderate, $\frac{2}{3}$ webbed; tips of fingers and toes swollen; subarticular tubercles well developed; a small oval inner metatarsal tubercle and a small rounded one at the base of the fourth toe. The tibio-tarsal articulation reaches the tip of the snout or not quite so far. Skin of upper parts smooth or granular. Dark olive to blackish above, or olive largely spotted or marbled with black; a yellow or white line from the tip of the snout along the canthus rostralis and the border of the upper eyelid, continued along each side of the back; hind limbs with black and light cross-bars, or orange spotted or barred with black. Male with internal vocal sacs.

From snout to vent 60 millim.

First described from Borneo, this frog has since been found in Sumatra and at the foot of Gunong Inas, between Kedah and Perak.

252. *Rana luctuosa*.

Limnodytes luctuosus, Peters, Mon. Berl. Ac. 1871, p. 579; id. Ann. Mus. Civ. Genova, iii, p. 43, pl. vi, fig. 1 (1872).

Rana luctuosa, Bouleng. Cat. Batr. Ecaud. p. 68 (1882); S. Flower, P. Z. S. 1896, p. 904, pl. xlv, and 1899, p. 896; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 199 (1903).

Rana decorata, Mocquard, N. Arch. Mus. (3) ii, p. 145, pl. x, fig. 1 (1890).

Vomerine teeth in two small oblique groups between the choanæ. Head moderate; snout rounded, as long as the orbit, with indistinct canthus rostralis and scarcely oblique, feebly concave loreal region; interorbital space broader than the upper eyelid; tympanum very distinct, about $\frac{2}{3}$ the diameter of the eye. Fingers rather short, first extending beyond second: toes moderate, $\frac{1}{3}$ webbed; tips of fingers slightly, of toes more distinctly dilated; subarticular tubercles moderate; a small, oval inner metatarsal tubercle; no outer metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout, or not quite so far. Skin smooth. Top of head and back bright red or rich dark chocolate-brown, bordered on each side from the end of the snout to the base of the hind limbs by a very distinct white or yellow line; sides of head and body very dark brown or black; tympanum dark reddish brown; along the lower part of the sides of the body a few white or yellow spots in an irregular line from angle of mouth to thigh; limbs very dark brown or bluish black with bluish-white or very pale grey or orange marblings or transverse lines; throat brown or black, remainder of the lower parts dirty buff, darker on the limbs, sometimes with small light spots. Iris pale golden bronze, extensively marked with very dark bronze. Male without vocal sacs.

From snout to vent 50 millim.

Tadpole with sinistral spiraculum and dextral anus. Lip bordered with papillæ and with 5 or 6 series of fine horny teeth above, only the outer uninterrupted, and 4 series beneath, the inner very narrowly interrupted, the remainder uninterrupted; beak broadly edged with black. Tail acutely pointed, the upper crest not extending on the back. Blackish brown above, white beneath, with a grey mottled tail. Total length 68 millim.

First described from Borneo, this very handsome frog has been found common on Penang Hill, between 2000 and 2200 feet, and in the Larut Hills, Perak, at an altitude of 4000 feet.

253. *Rana macrodactyla*.

Hylorana macrodactyle, Günth. Cat. Batr. Sal. p. 72, pl. ii, fig. C (1858); id. Rept. Brit. Ind. p. 424 (1864).

Rana trivittata, Hallow. Proc. Ac. Philad. 1860, p. 504.

? *Hylorana subcærulea*, Cope, Proc. Ac. Philad. 1868, p. 140.
Rana macrodactyla, Bouleng. Cat. Batr. Ecand. p. 54 (1882); id.
 Faun. Brit. Ind., Rept. p. 455 (1890); S. Flower, P. Z. S. 1899,
 p. 895; Laidlaw, P. Z. S. 1900, p. 885.

Vomerine teeth in two oblique groups or short series between the choanæ. Head depressed, much longer than broad; snout long, pointed; canthus rostralis obtuse; loreal region not very oblique, concave; nostril much nearer end of snout than eye; interorbital space as broad as or broader than the upper eyelid; tympanum very distinct, nearly as large as the eye, or at least $\frac{3}{4}$ its diameter. Fingers slender, elongate, first not extending beyond second; foot as long as or nearly as long as the distance between tympanum and vent; toes very slender, half-webbed; tips of fingers and toes dilated into very small disks; subarticular tubercles moderate; a small oval inner and a small rounded outer metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout or a little beyond. Skin smooth; a narrow glandular dorso-lateral fold. Colour, in life, above rich dark brown, spotted with black, and in some individuals mottled with dull yellow and vivid green, with four or five very distinct longitudinal lines, which are white with golden shades; the median line (rarely absent) from the snout to the vent, the next on the dorso-lateral fold, the outer from the tympanum to the hind limb; upper surface of limbs reddish yellow with dark brown markings, forming short cross-bars on the thigh and the sides of the tibia, and two or three lines along the back of the thigh; head and body white beneath, limbs yellowish. Iris golden. Male without vocal sacs.

From snout to vent 42 millim.

Southern China, Burma, Siam, Malay Peninsula. Capt. Flower obtained many specimens near Jenan and Alor Star, Kedah, and Dr. Annandale caught them hopping about in a rice-field near Biserat, Jalor. Capt. Flower found them among swampy paddy-fields, sitting in the grass on the ridges between the submerged fields, leaping into the water when alarmed, but always at once swimming back to the land. "Remarkably nimble, active frogs, and specimens I had in captivity used to climb up a vertical surface of glass like a true tree frog."

254. *Rana lateralis*.

Bouleng. Ann. Mus. Civ. Genova (2) v, p. 483, pl. viii, fig. 2 (1887);
 id. Faun. Brit. Ind., Rept. p. 457 (1890); Laidlaw, P. Z. S.
 1900, p. 886, pl. lvii, figs. 1 & 2.

Vomerine teeth in two oblique series between the choanæ, and extending to the inner anterior corners of the latter, widely separated from each other. Head moderate; snout as long as the orbit, acuminate, projecting; nostril equally distant from orbit and from end of snout; loreal region concave; interorbital space

as broad as the upper eyelid; tympanum as large as or a little smaller than the eye. Fingers moderate, first much longer than second; toes $\frac{3}{5}$ webbed; tips of fingers and toes feebly dilated; sub-articular tubercles small; a large, compressed, very prominent inner metatarsal tubercle, $\frac{2}{3}$ the length of the inner toe; no outer metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Skin smooth; a narrow glandular dorso-lateral fold; the specimen from Kwala Aring has very curious fine glandular folds across the back, running obliquely backwards from left to right. Back grey, sides black or grey with black spots, the black sharply separated from the grey on the lateral fold and on the canthus rostralis; a black line borders the upper lip, separated from the black loreal and temporal regions by a broad pure white band which extends to above the shoulder and sends up a process behind the tympanum; a black humeral spot; hind limb with black cross-bars; hinder side of thighs marbled black and white; throat blackish, with a whitish median line; breast closely spotted with black; belly white. Male with internal vocal sacs.

From snout to vent 70 millim.

Originally described from Tenasserim. Mr. Laidlaw caught a single specimen in thick jungle at Kwala Aring, Ulu Kelantan.

255. *Rana nicobariensis*.

Hylorana nicobariensis, Stoliczka, Journ. Asiat. Soc. Beng. xxxix, p. 150, pl. ix, fig. 2 (1870).

Rana nicobariensis, Bouleng. Ann. & Mag. Nat. Hist. (5) xvi, p. 389 (1885); id. Faun. Brit. Ind., Rept. p. 459 (1890); id. Ann. & Mag. Nat. Hist. (6) viii, 1891, p. 291.

Rana erythraea, var. *elongata*, Werner, Jahresb. Nat. Ver. Magdeb. 1892, p. 525.

Rana lemniscata, Boettg. Zool. Anz. 1893, p. 337.

Vomerine teeth in two oblique series between the choanæ. Head a little longer than broad; snout more or less pointed, as long as or a little longer than the orbit, with distinct canthus rostralis and nearly vertical, concave loreal region; nostril much nearer tip of snout than eye; interorbital space a little broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye. Fingers moderate, first extending a little beyond second; toes moderate, $\frac{2}{3}$ webbed; tips of fingers and toes dilated into small but very distinct disks; subarticular tubercles rather small; a small oval inner metatarsal tubercle, and a smaller, rounded one at the base of the fourth toe. The tibio-tarsal articulation reaches the tip of the snout, or not quite so far. Upper parts smooth or finely granular, back and sides sometimes with a few small glandules; a strong but narrow glandular dorso-lateral fold. Greyish or reddish brown, uniform or spotted with darker; sides of head dark brown or black, which shade

may be prolonged on the sides of the body below the lateral fold; a white streak on the upper lip; limbs with dark cross-bars; white beneath, uniform or spotted with brown, throat and breast brown in the male. Male with internal vocal sacs and a flat oval gland on the inner side of the arm.

From snout to vent 55 millim.

Nicobars, Malay Peninsula, Sumatra, Borneo, Mentawai Ids., Java. A specimen from the Batu Caves, near Kuala Lumpur, Selangor, is in the British Museum; also known from Kuala Tahan, Pahang.

256. *Rana erythræa*.

Hyla erythræa, Schleg. Abbild. p. 27, pl. ix, fig. 3 (1837).

Limnodytes erythræus, Dum. & Bibr. Erp. Gén. viii, p. 511, pl. lxxxviii (1841); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1062 (1847).

Hylorana erythræa, Günth. Rept. Brit. Ind. p. 425 (1864).

Rana erythræa, Bouleng. Cat. Batr. Ecaud. p. 65 (1882); id. Faun. Brit. Ind., Rept. p. 460 (1890); S. Flower, P. Z. S. 1896, p. 902, pl. xlv, fig. 2, and 1899, p. 895; Laidlaw, P. Z. S. 1900, p. 885; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 198 (1903).

Vomerine teeth in two oblique groups between the choanæ. Head a little longer than broad; snout longer than the orbit, obtusely pointed and projecting; canthus rostralis strong; loreal region concave; nostril much nearer end of snout than eye; inter-orbital space as broad as the upper eyelid; tympanum very distinct, nearly as large as the eye. Fingers rather slender, first not extending beyond second; toes nearly entirely webbed; tips of fingers and toes dilated into small but well-developed disks; sub-articular tubercles moderate; a small oval inner metatarsal tubercle; no outer metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout. Skin smooth; a rather broad and prominent glandular dorso-lateral fold. Bright green above, changing to dull green or yellowish brown; a very dark brown stripe, generally darker at the edges, along each side of the head and body from the nose to the hind limb; glandular lateral fold white or yellowish white; upper lip yellow; limbs reddish-buff or yellowish brown, without cross-bars; lower parts pure white. Iris golden or golden-orange. Male with internal vocal sacs.

From snout to vent 75 millim.

Burma, Siam, Malay Peninsula and Archipelago. Recorded from Penang, Province Wellesley, Perak, Kedah, Jalor, Singapore.

Capt. Flower says it is a true water-frog and appears to occur only at low elevations. It is most active both on land and in the water; it can hop over the surface of a pond, much as *R. cyano-phlyctis* does in India, and also jump right out of the water. Owing to the vivid green colour of its back exactly matching the colour of the weeds in a pond, it is often difficult to see but for its bright golden eyes.

Mr. Butler says it is never found away from water. Known together with *Rhacophorus leucomystax* as *Katak pisang*, "Banana-leaf frog," from the colour of its back.

257. *Rana nigrovittata*.

Limnodytes nigrovittatus, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 718 (1855).

Rana nigrovittata, Bouleng. Ann. Mus. Civ. Genova (2) xiii, p. 334, pl. viii, fig. 3 (1893); S. Flower, P. Z. S. 1899, p. 896; Robinson, Journ. Fed. Malay States Mus. i, 1905, p. 20.

Vomerine teeth in two oblique groups on a level with or just behind the posterior borders of the choanæ. Head as long as broad or a little broader than long; snout rounded, shorter than the orbit; canthus rostralis strong; loreal region nearly vertical, slightly concave; nostril nearer end of snout than eye; inter-orbital space as broad as the upper eyelid; tympanum very distinct, $\frac{3}{4}$ to $\frac{4}{5}$ the diameter of the eye. Fingers moderate, first extending beyond second; toes nearly entirely webbed; tips of fingers and toes dilated into small but well-developed disks; sub-articular tubercles strong; inner metatarsal tubercle small, oval; a small but very prominent, round tubercle at the base of the fourth toe. The tibio-tarsal articulation reaches the tip of the snout, or between the eye and the tip of the snout. Skin more or less distinctly granulate on the head and back; a broad but feebly prominent glandular dorso-lateral fold. Brown above, uniform or with a few small darker spots; a blackish stripe on each side, from the tip of the snout to the groin, passing through the eye, involving the tympanum, and bordering the dorso-lateral fold; a white streak from below the eye to the shoulder; limbs with dark cross-bars; hinder side of thighs spotted or marbled with black; lower parts whitish, throat and breast more or less obscured with brown mottlings. Male with internal vocal sacs and a large flat gland on the inner side of the arm.

From snout to vent 60 millim.

Tonkin, Burma, Siam. Young specimens, which I have referred to this species, have been found by Mr. Robinson in muddy pools at the foot of the hills in which the Batu Caves, Selangor, are situated.

258. *Rana labialis*.

Bouleng. Ann. & Mag. Nat. Hist. (5) xix, p. 345, pl. x, fig. 1 (1887); id. Ann. Mus. Civ. Genova (4) xiv, p. 617 (1894); S. Flower, P. Z. S. 1896, p. 903, pl. xlv, fig. 3; Peracca, Rev. Suisse Zool. vii, p. 329 (1899); Laidlaw, P. Z. S. 1900, p. 886; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 199 (1903).

Vomerine teeth in two oblique series between the posterior borders of the choanæ. Head longer than broad; snout acuminate, as long as or longer than the orbit; canthus rostralis strong;

loreal region nearly vertical and deeply concave; nostril much nearer end of snout than eye; interorbital space as broad as or a little broader than the upper eyelid; tympanum very distinct, at least $\frac{3}{4}$ the diameter of the eye, sometimes as large as the eye. Fingers rather slender, first not extending quite as far as second; toes moderate, $\frac{3}{4}$ or nearly entirely webbed; tips of fingers dilated into large disks, the diameter of which equals about half that of the tympanum; disks of toes smaller; subarticular tubercles moderate; two small metatarsal tubercles, outer rather indistinct, rarely absent. The tibio-tarsal articulation reaches the tip of the snout or a little beyond. Upper parts finely granulate; a glandular dorso-lateral fold, distinct only anteriorly. Bright green or bronze brown above, turning to brown or purple in spirit, sides dark green or dark brown, with rather indistinct darker spots; tympanum chestnut-brown; a white or light golden streak on the upper lip; limbs with more or less distinct dark cross-bands; whitish beneath, throat and breast spotted or marbled with brown. Male with internal vocal sacs.

From snout to vent 55 millim.

Tadpole with sinistral spiraculum and dextral anus, the skin very transparent, the intestines being clearly seen; on the back on each side behind the eye a patch of granulated skin. Lip fringed with papillæ on the sides and beneath; upper lip with 4 series of fine teeth, the outermost uninterrupted; lower lip with 3 series of teeth, the two outer uninterrupted; beak edged with black. Tail pointed, the upper crest not extending on the back. Brick-red above, pale yellow beneath. Total length 37 millim.

The type specimens are from Malacca. The species has been found also in the Mentawai Islands, in Sumatra, in Singapore, in Selangor near Kuala Lumpur, and on Gunong Inas between Kedah and Perak. Found in bushes as well as in the water; less aquatic than *R. erythraea*.

259. *Rana hosii*.

Bouleng. Ann. & Mag. Nat. Hist. (6) viii, p. 290 (1891); id. Journ. Fed. Malay States Mus. iii, p. 62 (1908).

Vomerine teeth in two strong oblique series extending posteriorly beyond the level of the choanæ. Head as long as broad or slightly longer than broad; snout subacuminate, as long as the orbit; canthus rostralis strong; loreal region slightly oblique and deeply concave; nostril nearer end of snout than eye; interorbital space as broad as or a little narrower than the upper eyelid; tympanum very distinct, $\frac{1}{2}$ diameter of eye in females, $\frac{2}{3}$ to $\frac{3}{4}$ in males. Fingers and toes moderately elongate and expanded at the end into large disks, those of the outer fingers as large as or smaller than the tympanum; first finger not extending beyond second; toes webbed to the disks; subarticular tubercles well developed; inner metatarsal tubercle elliptic, feebly

prominent; no outer metatarsal tubercle. The tibio-tarsal articulation reaches a little beyond the end of the snout; tibia not $\frac{2}{3}$ length of head and body. Upper parts finely granulate; a feebly prominent glandular dorso-lateral fold. Uniform purplish brown above, darker on the sides, especially of the head; a white or whitish streak along the upper lip; limbs with darker cross-bars, which may be very indistinct; lower parts white, uniform or spotted or marbled with brown. Male with internal vocal sacs.

From snout to vent 95 millim. Males much smaller (50 millim.).

Originally described from Borneo, since found in Sumatra and Java. Specimens were obtained in Pahang, at Kuala Teku and on the Tahan River, altitude 500 feet, by Mr. Robinson.

260. *Rana jerboa*.

Hylorana jerboa, Günth. P. Z. S. 1872, p. 599, pl. xl.

Rana jerboa, Bouleng. Cat. Batr. Ecaud. p. 67 (1882); id. Ann. Mus. Civ. Genova (2) xiii, p. 335 (1893); id. P. Z. S. 1893, p. 526; S. Flower, P. Z. S. 1899, p. 916; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 199 (1903); Van Kampen, Natuurk. Tijdschr. Ned. Ind. lxi, p. 39, pl. ii, figs. 3-6 (1909).

Vomerine teeth in two short, transverse or oblique series between the choanæ or extending beyond the level of the latter. Head as long as broad or slightly longer than broad; snout rounded or obtusely pointed, as long as or a little longer than the orbit; canthus rostralis strong; loreal region slightly oblique and deeply concave; nostril equally distant from eye and from end of snout; interorbital space as broad as or a little narrower than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{4}{5}$ the diameter of the eye. Fingers and toes rather slender, with rather large disks, which are much smaller than the tympanum; first and second fingers equal, or first slightly longer; toes webbed to the disks; sub-articular tubercles well developed; inner metatarsal tubercle small, oval, feebly prominent; no outer metatarsal tubercle. The tibio-tarsal articulation reaches far beyond the tip of the snout; tibia $\frac{2}{3}$ to $\frac{4}{5}$ length of head and body. Upper parts finely granulate; a moderately prominent glandular dorso-lateral fold. Brown or greyish above, uniform or marbled with darker, darker on the sides, especially of the head; a more or less distinct light streak along the upper lip; limbs with darker cross-bars, which may be very indistinct; lower parts white, uniform or throat and breast spotted or speckled with brown. Male with internal vocal sacs.

From snout to vent 102 millim. Males much smaller (50 millim.).

The tadpole has been figured in the Catalogue of Batrachia Ecaudata, p. 89. It is remarkable for the presence of a large sucking disk behind the mouth, free on its borders, truncate in front. Spiraculum on the left side. Lips much developed, not fringed, with 4 series of fine horny teeth above, the outer uninterrupted, and 4 beneath, only the inner interrupted; beak

black, feebly denticulate. Tail pointed, the upper crest not extending to the base of the muscular part. Total length 60 millim.

Similar larvæ, specially adapted for life in torrential streams, are produced by the two following species.

Burma, Malay Peninsula, Sumatra, Borneo, Java. The only specimens known from the Malay Peninsula are from the Batu Caves and from Bukit Itam, Selangor, 1500 feet, where it is very abundant.

261. *Rana livida*.

Polypedates lividus, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 718 (1855).

Polypedates chloronotus, Günth. P. Z. S. 1875, p. 569, pl. lxxv, fig. A.

Rana chloronota, Bouleng. Cat. Batr. Ecaud. p. 69 (1882).

Rana livida, Bouleng. Faun. Brit. Ind., Rept. p. 462 (1890); A. L.

Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 201 (1903).

Vomerine teeth in two oblique series commencing between, and extending posteriorly beyond, the choanæ. Head much depressed, about as long as broad; snout rounded, shorter than the orbit; canthus rostralis obtuse; loreal region nearly vertical, concave; nostril a little nearer tip of snout than eye; interorbital space as broad as the upper eyelid; tympanum distinct, about half the diameter of the eye. Fingers moderate, depressed, first extending slightly beyond second; toes webbed to the disks; tips of fingers and toes dilated into very large disks, that of the third finger as large as the tympanum; subarticular tubercles large; a small oval inner metatarsal tubercle; no outer metatarsal tubercle. The tibio-tarsal articulation reaches beyond the tip of the snout; tibia as long as the trunk. Skin smooth. Upper surface of head and body green, usually with a few black spots; sides of head and body and limbs dark brown; limbs with blackish cross-bands; groin and back of thighs with yellow spots or marblings; a white streak along the upper lip; beneath white or yellowish, the throat usually speckled with brown. Male with two external vocal sacs, below the angles of the mouth.

From snout to vent 90 millim.

The tadpole of this species is provided with an adhesive ventral disk or sucker; it has a round black spot on each side behind the eye and another on each side of the belly, near the base of the tail. Total length 52 millim.

Eastern Himalayas, mountains of Assam and Burma; a specimen was obtained in the Larut Hills, Perak, by Mr. L. Wray.

262. *Rana larutensis*.

Bouleng. Ann. & Mag. Nat. Hist. (7) iii, p. 273, pl. xi, fig. 1 (1899);

S. Flower, P. Z. S. 1899, p. 898; Laidlaw, P. Z. S. 1900, p. 886

pl. lvii, figs. 3 & 4; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 200 (1903); Bouleng. Journ. Fed. Malay States Mus. iii, p. 63 (1908).

Vomerine teeth in two very small groups just behind the level of the choanæ. Head as long as broad; snout rounded or sub-acuminate, shorter than the orbit; canthus rostralis sharp; loreal region concave; nostril equally distant from eye and from end of snout; interorbital space narrower than the upper eyelid; tympanum distinct, $\frac{1}{3}$ the diameter of the very large eye. Fingers moderate, the tips dilated into large disks, which are larger than the tympanum; first finger shorter than second; toes very broadly webbed, the web involving part of the terminal disks, which are smaller than those of the fingers; subarticular tubercles feeble; a small, feebly prominent, oval inner metatarsal tubercle; no outer metatarsal tubercle. The tibio-tarsal articulation reaches beyond the tip of the snout; tibia $\frac{3}{5}$ to $\frac{2}{3}$ length of head and body. Skin smooth or faintly granular; a feeble interrupted dorso-lateral fold sometimes present. Above pale yellowish green, the head and body very extensively blotched with black, the limbs with black transverse bars; below, head and body pure white, limbs pale green and grey, hands and feet very dark, and web between the toes black. Iris olive-brown, with a very narrow gold ring round the pupil.

From snout to vent 70 millim. Males much smaller (45 millim.).

Tadpole provided with a well-developed ventral sucker extending from the lip to beyond the middle of the abdomen. Beak minutely serrated; 9 upper series of labial teeth, 4 uninterrupted and 5 interrupted; 5 lower series, 4 uninterrupted and 1 interrupted. Greenish white, mottled with dark green. Total length 65 millim.

Capt. Flower discovered this frog in numerous individuals sitting on the rocks in a swift rocky mountain-stream in the Larut Hills, Perak. Mr. Laidlaw found it extremely common along the banks of the rapid jungle-torrents running about the foot of Gunong Inas. The frogs sit on the great boulders strewn along the courses of the streams, and when one approaches them spring boldly into the water, no matter how fiercely it may be pouring down. Soon after being disturbed they will again take up their station on the rock which they had quitted, and in such a position their colouring renders them well-nigh invisible. Mr. Robinson obtained specimens in Pahang, between 500 and 5200 feet, and at Ginting Simpah, near Kuala Lumpur, at an altitude of 1800 feet. The species occurs also in Borneo.

Genus **RHACOPHORUS.**

Kuhl, Isis, 1827, p. 294.

Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth. Tympanum usually distinct. Fingers free or more or less webbed; toes webbed; tips of fingers and toes dilated into regular disks. Outer metatarsals separated by web. Omosternum and sternum with a bony style. An intercalary ossification between the penultimate and distal phalanges; latter usually bifurcate.

Eastern and South-Eastern Asia and Madagascar. Five species are known from the Malay Peninsula.

Arboreal frogs, remarkable for the frothy masses containing eggs which many species deposit outside the water, some even in the form of nests attached to the leaves of a tree or shrub overhanging a pool (see H. S. Ferguson, Journ. Nat. Hist. Soc. Bombay, xv, 1904, p. 503, pl. C).

Synopsis of the Species.

I. Fingers free or with a rudiment of web.

Upper parts very warty *R. leprosus*, p. 247.

Upper parts smooth, upper surface of head
rugose in the adult *R. leucomystax*, p. 248.

II. Fingers entirely webbed.

No cutaneous folds along the limbs; loreal
region nearly vertical *R. robinsonii*, p. 249.

Cutaneous folds along the limbs and above
the vent feebly developed; loreal region
oblique *R. bimaculatus*, p. 250.

Cutaneous folds along the limbs and above
the vent strongly developed; loreal region
oblique *R. nigropalmatus*, p. 251.

263. Rhacophorus leprosus.

Theloderma leprosum, Tschudi, N. Class. Batr. pp. 32 & 73 (1838);

Horst, Notes Leyd. Mus. v, p. 237 (1883).

Hyla leprosa, Schleg. Handl. Dierk. p. 55, pl. iv, fig. 68 (1857).

Polypedates leprosus, Günth. Ann. & Mag. Nat. Hist. (5) xx, p. 315,
pl. xvi, fig. A (1887).

Rhacophorus leprosus, Bouleng. P. Z. S. 1890, p. 284; S. Flower,
P. Z. S. 1896, p. 907; A. L. Butler, Journ. Nat. Hist. Soc.
Bombay, xv, p. 203 (1903); Robinson, Journ. Fed. Malay States
Mus. i, p. 29 (1905).

Vomerine teeth in two short transverse series touching the inner front edges of the choanæ. Snout rounded, as long as the orbit; canthus rostralis distinct; loreal region concave; nostril nearer end of snout than eye; interorbital space broader than the

upper eyelid; tympanum very distinct, $\frac{3}{4}$ the diameter of the eye. Fingers free, toes nearly entirely webbed; disks not more than half the size of the tympanum; subarticular tubercles well developed; a very small inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts covered with large warts and tubercles of different sizes bearing granular asperities; lower parts, except the limbs, granular. Colour in life rich warm chocolate-brown above, the top of the warts paler, some of those on the back yellow; jet-black beneath, marbled with pale bluish grey; under surface of fingers and toes, interdigital web, and disks bright rose-red. Iris pale warm brown, pencilled radially with black, with a fine yellowish-orange line bordering the pupil. Male without vocal sac.

From snout to vent 65 millim.

Larut Hills, Perak, 4000 feet; Gunong Angsi, Negri Sembilan, 2600 feet; and Sumatra.

Mr. L. Wray, who discovered this remarkable frog in the Malay Peninsula, remarks as follows:—

“The colour and rugose character of the skin of this frog is evidently a means of protecting it from birds and other enemies, the whole upper surface being such a close copy of the back of a tree that it is very hard to detect one when resting upon it. This species also lives in holes in trees, and the note produced by it is not so loud as that of *Phrynellæ*, and has a more metallic ring in it.”

Six or eight specimens were obtained by Mr. Wray at the same spot twenty-five years ago, but the frog has since been found on only one occasion on Gunong Angsi, Negri Sembilan, as recorded by Mr. Robinson.

264. *Rhacophorus leucomystax*.

Hyla leucomystax, Gravenh. Delic. Mus. Vratisl. p. 26 (1829).

Hyla sexvirgata, Gravenh. op. cit. p. 28.

Hyla quadrilineata, Wieg. N. Acta Ac. Leop.-Carol. xvii, i, p. 260, pl. xxii, fig. 1 (1835).

Polypedates leucomystax, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1063 (1847).

Polypedates maculatus, part., Günth. Rept. Brit. Ind. p. 428 (1864).

Polypedates quadrilineatus, Günth. op. cit. p. 429.

Rhacophorus maculatus, part., Bouleng. Cat. Batr. Ecaud. p. 83 (1882).

Rhacophorus leucomystax, Bouleng. Faun. Brit. Ind., Rept. p. 474

(1890); S. Flower, P. Z. S. 1896, p. 905, pl. xlv, fig. 2, and 1899, p. 898, pl. lix, fig. 3; Laidlaw, P. Z. S. 1900, p. 887; A. L.

Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 202 (1903).

Vomerine teeth in two more or less oblique series between the choanæ, or commencing close to the inner front edges of the latter. Upper surface of head rugose in the adult, the skin adhering to

the nasal and frontoparietal bones; snout obtusely pointed, about as long as the orbit; canthus rostralis distinct; loreal region concave; nostril much nearer end of snout than eye; interorbital space broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ the diameter of the eye. Fingers with a slight rudiment of web; toes $\frac{2}{3}$ webbed; disks moderate, smaller than the tympanum; subarticular tubercles moderate; a small inner metatarsal articulation. The tibio-tarsal articulation reaches the eye, or between the eye and the tip of the snout. Skin smooth above, granulate on the belly and under the thighs; a fold from eye to shoulder. Colour very changeable, even in the same individual; upper parts grey, yellow, brown, reddish, or greenish, spotted or mottled with brown or black, or with four dark longitudinal bands on the head and body; limbs with dark cross-bars; hinder side of thighs uniform or light-spotted; lower parts white or buff. Male with internal vocal sacs.

From snout to vent 75 millim.

Tadpole with the eyes lateral, sinistral spiraculum and dextral anus. Mouth with a large circular lip, bordered with papillæ on the sides and beneath, the upper part with 4 or 5 series of fine horny teeth, the uppermost uninterrupted, the others interrupted, the lower part with 3 long series uninterrupted or the third narrowly interrupted; beak black. Tail very acutely pointed, the upper crest not extending on the back. Total length up to 46 millim.

Southern China, Sikkim, and Assam to Malay Peninsula and Archipelago. Generally distributed and common in the Malay Peninsula, up to 5000 feet, as well as at sea-level.

Capt. Flower observes that this frog apparently breeds at various times of the year, as specimens are frequently to be seen in the evening in embrace on the edges of rain-water butts of houses, from March to October. The spawn floats on the surface of the water, enclosed in an envelope resembling white foam. Mr. Laidlaw observed the breeding in August and September. The eggs were laid in a frothy mass on the leaves of trees overhanging small pools of water; after a short time they slid off the leaves and fell into the water, where the frothy envelope dissolved away, setting free the tadpoles. Mr. Butler observes that about houses, tubs of rain-water are commonly used as breeding-places.

265. *Rhacophorus robinsonii*.

Bouleng. Fascic. Malay., Zool. i, p. 136, pl. v, fig. 2 (1903), and Journ. Fed. Malay States Mus. iii, p. 63 (1908).

Vomerine teeth in two long oblique series touching the inner front edges of the choanæ. Snout obtusely pointed, as long as the orbit, with straight canthus rostralis and nearly vertical,

slightly concave loreal region; nostril a little nearer end of snout than eye; interorbital space a little broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ the diameter of the eye. Fingers and toes webbed to the disks; disks of fingers as large as the tympanum, of toes a little smaller; subarticular tubercles small; a very small inner metatarsal tubercle. The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout. Skin smooth, granulate on the belly and under the thighs; a strong fold above the temple. Pinkish brown or pale coffee colour above, bluish grey on the sides of the body and limbs; sides of head darker, purplish grey to blackish, which shade is sharply defined on the canthus rostralis; more or less defined dark spots on the back; limbs with greyish brown cross-bars; interdigital webs blackish, with light veins; whitish beneath, throat spotted or mottled, belly marbled with grey.

From snout to vent 82 millim.

The type specimen was obtained by Messrs. Annandale and Robinson on Bukit Besar, at an altitude of 2500 feet, in thick jungle. A second was obtained by Mr. Robinson at Kuala Teku, Pahang, altitude 500 feet.

266. *Rhacophorus bimaculatus*.

Bouleng. Cat. Batr. Ecaud. p. 90 (1882); id. Faun. Brit. Ind., Rept. p. 472 (1890); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 202 (1903).

Vomerine teeth in two long oblique series touching the inner front edges of the choanæ. Snout rounded, as long as the orbit; canthus rostralis obtuse; loreal region concave; nostril nearly halfway between eye and tip of snout; interorbital space broader than the upper eyelid; tympanum distinct, half the diameter of the eye. Fingers nearly entirely webbed, the disks as large as the tympanum; toes webbed to the disks, which are smaller than those of the fingers; subarticular tubercles well developed; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches the eye or the nostril. Skin smooth above, granular beneath; head with a small triangular dermal process; feebly developed dermal folds along the limbs and above the vent. Green above, uniform or speckled with darker; upper arm not coloured; only the outer finger and toe green; a large black spot on each side behind the arm, generally followed by a smaller one; lower parts white. Male with a subgular vocal sac.

From snout to vent 65 millim.

Khasi Hills in Assam and Karin Hills in Burma. The only specimen known from the Malay Peninsula is from Larut, Perak, and was submitted to me for identification by Mr. L. Wray.

267. *Rhacophorus nigropalmatus*.

Bouleng. Ann. & Mag. Nat. Hist. (6) xvi, p. 170 (1895); S. Flower, P. Z. S. 1899, p. 899; Werner, Zool. Jahrb., Syst. xiii, p. 496 (1900); Bouleng. Fascic. Malay., Zool. i, p. 137, pl. vi, fig. 1 (1903).

Vomerine teeth in two long, straight or slightly curved transverse series between the front edges of the choanae. Snout

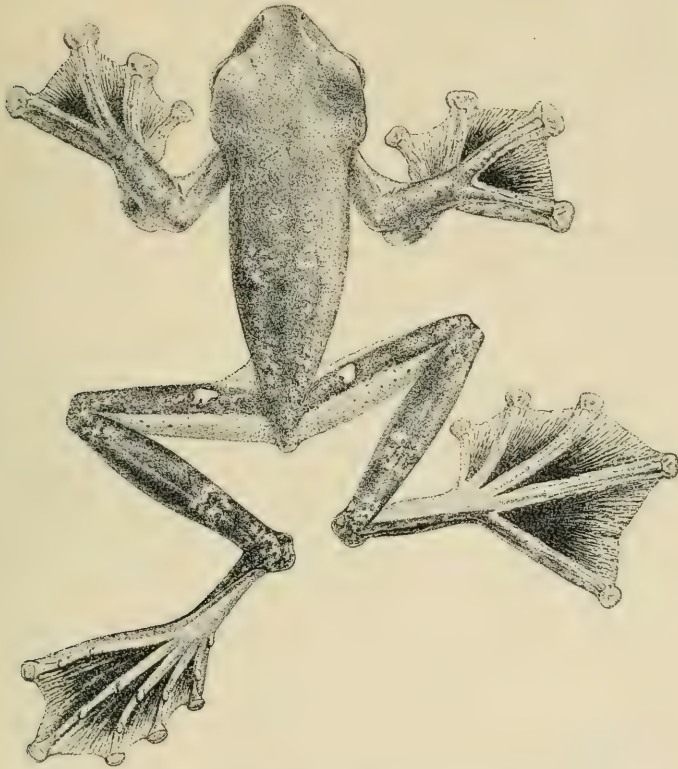


Fig. 71.—*Rhacophorus nigropalmatus*.
(From Fascic. Malay.)

rounded, as long as the orbit, with feeble, curved canthus rostralis; loreal region concave; nostril near the tip of the snout; inter-orbital space broader than the upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye. Fingers and toes webbed to the disks, which are as large as or smaller than the tympanum; sub-articular tubercles small; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches the nostril or the tip of the snout. Skin smooth or finely granulate above, coarsely granulate on the

belly and under the thighs; a strong dermal fold along the outer edge of the forearm and tarsus, at the heel, and above the vent. Colour in life green above, powdered with white or with lichen-like white markings; one or two conspicuous white spots on the upper surface of the thigh; flanks yellow or orange, veined with black; interdigital membranes black at the base, yellow or orange, veined with black, towards the border; throat and chest cream-colour, belly and lower surface of limbs salmon-pink, sometimes dotted over with yellow.

From snout to vent 100 millim.

Malay Peninsula (Perak, Ulu Legoh), Sumatra, Borneo.

This is probably the species alluded to by Wallace (Malay Archipelago, i, p. 60) as the "flying-frog" of Borneo. Mr. Robinson, who took a specimen at Mabek, Jalor, noted that it dropped almost vertically from a tall tree growing at the edge of a large clearing in the jungle. Beyond the statement of the Chinaman who procured Wallace his specimen, there is no evidence to prove that the so-called flying-frog uses its webbed hands and feet as a parachute to support itself in the air.

Genus **IXALUS**.

Dum. & Bibr. Erp. Gén. viii, p. 523 (1841).

Pupil horizontal. Tongue free and deeply notched behind. Vomerine teeth none. Tympanum distinct or hidden. Fingers free or more or less webbed; toes webbed; tips of fingers and toes dilated into regular disks. Outer metatarsals separated by a groove or narrow web. Omosternum and sternum with a bony style. An intercalary ossification between the penultimate and distal phalanges; latter obtuse or bifurcate.

South-Eastern Asia. Represented by seven species in the Malay Peninsula.

Arboreal frogs, differing from the preceding by the absence of vomerine teeth. Mostly of small size.

Synopsis of the Species.

I. Fingers free or with a rudiment of web.

A. Upper parts smooth or nearly so; tympanum, if distinct, not more than half diameter of eye; throat granular.

1. Tympanum not very distinct, or hidden; fingers quite free.

Tibio-tarsal articulation reaching posterior border of eye

I. brevipes, p. 253.

Tibio-tarsal articulation reaching between eye and end of snout

I. larutensis, p. 253.

Tibio-tarsal articulation reaching end of snout ..

I. castanomerus,
[p. 254.]

2. Tympanum very distinct; fingers with a rudiment of web

I. vermiculatus,
[p. 254.]

- B. Upper parts rough with granular tubercles; tympanum very distinct, at least $\frac{2}{3}$ diameter of eye; throat smooth.
 Snout pointed; loreal region nearly vertical; toes half-webbed *I. pictus*, p. 255.
 Snout rounded; loreal region oblique; toes at least $\frac{3}{4}$ webbed *I. asper*, p. 255.
 II. Fingers half-webbed; upper parts with large warts and granular asperities *I. horridus*, p. 256.

268. *Ixalus brevipes*.

Bouleng. Journ. Fed. Malay States Mus. iii, p. 63, pl. iv, fig. 1 (1908).

Head large, much depressed; snout rounded, shorter than the orbit; canthus rostralis obtuse; loreal region concave; nostril nearer tip of snout than eye; interorbital space broader than the upper eyelid; tympanum not very distinct, $\frac{1}{3}$ diameter of eye. Fingers short, free, with large disks; toes short, barely half-webbed; a small inner metatarsal tubercle. Tibio-tarsal articulation reaching the posterior border of the eye. Skin smooth above, glandular on the sides, granular on the throat and belly. Greyish olive above, with symmetrical markings, viz. a large transverse band between the eyes and a large marking on the anterior part of the back, trifold in front, the median branch bifurcate and extending to the upper eyelids, bifid behind; a dark canthal streak; sides reddish brown with white dots; limbs with dark cross-bars; lower parts dirty white.

From snout to vent 31 millim.

Described from a single specimen obtained by Mr. Robinson on Gunong Tahan, Pahang, at 3000 feet altitude.

269. *Ixalus larutensis*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 187 (1900); id. Fascic. Malay., Zool. i, p. 139, pl. v, figs. 3 & 4 (1903).

Snout rounded or obtusely pointed, as long as the orbit; canthus rostralis distinct; loreal region concave; nostril a little nearer end of snout than eye; interorbital space as broad as the upper eyelid; tympanum moderately distinct in the adult, indistinct in the young, half the diameter of the eye. Fingers free, toes half-webbed; disks of fingers as large as the tympanum; subarticular tubercles moderate; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts smooth, or with small flat warts; throat, belly, and lower surface of thighs granulate. Grey-brown or reddish brown above, with dark brown symmetrical markings, a cross-band between the eyes being constant; a whitish vertebral

line and a similar line along the upper surface of the thigh and leg sometimes present; usually a)(- or)-(shaped marking on the anterior part of the body; sides of body and of thighs with white spots on a brown ground, or between the meshes of a brown network; a dark brown lumbar spot may be present; limbs with dark cross-bands; lower parts white, spotted or speckled with brown, sometimes with a white median line from chin to breast. A specimen from Gunong Tahan is blackish brown on the sides and limbs, with the upper surface of the head and a broad band on the dorsal region of a very pale brown.

From snout to vent 35 millim.

Larut Hills, between 4000 and 4500 feet, Bukit Besar, 2500 to 3500 feet, and Gunong Tahan, Pahang, 3000 feet. The Bukit Besar specimens were found among dead leaves, to which they bore a remarkable resemblance, on the jungle floor.

270. *Ixalus castanomerus*.

Bouleng. Journ. Fed. Malay States Mus. i, p. 39, pl. iv, fig. 1 (1905).

Head rather large; snout obtusely pointed, as long as the orbit; canthus rostralis distinct; loreal region concave; nostril a little nearer end of snout than eye; interorbital space as broad as the upper eyelid; tympanum slightly distinct, $\frac{2}{5}$ diameter of eye. Fingers free, toes half-webbed; disks of fingers larger than the tympanum; subarticular tubercles moderate; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout. Upper parts finely shagreened; throat, belly, and lower surface of thighs granulate. Greyish white, with a large darker grey blotch covering the greater part of the back and extending T-shaped to between the eyes; this blotch, which is speckled with black, with sharp concave outline on each side; upper lip and loreal and temporal regions with dark marblings; limbs with oblique dark cross-bands; sides of thighs and lower surface of tibiæ chestnut-brown; lower parts whitish, with brown network.

Total length 32 millim.

Described from a single specimen from Bukit Kutu, Selangor, 3500 feet.

271. *Ixalus vermiculatus*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 187 (1900); id. Journ. Fed. Malay States Mus. i, p. 39, pl. iv, fig. 2 (1905).

Head large; snout rounded, as long as the orbit; canthus rostralis distinct; loreal region concave; nostril a little nearer end of snout than eye; interorbital space as broad as the upper eyelid; tympanum distinct, $\frac{2}{5}$ the diameter of the eye. Fingers

with a rudiment of web; toes half webbed; disks of fingers as large as the tympanum; subarticular tubercles moderate; a small inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts smooth; throat, belly, and lower surface of thighs granulate. Olive-green above, closely vermiculate with black; upper surface of thighs with a series of large black blotches; sides of thighs and anal region orange-yellow; white beneath. Male with a large gular vocal sac.

From snout to vent 33 millim.

Described from three specimens from the Larut Hills, Perak, at 4000 feet altitude, obtained by Mr. A. L. Butler among ferns and moss.

272. *Ixalus pictus*.

Peters, Mon. Berl. Ac. 1871, p. 580; id. Ann. Mus. Civ. Genova, iii, p. 44, pl. vi, fig. 3 (1872); Bouleng. Cat. Batr. Ecaud. p. 99 (1882); S. Flower, P. Z. S. 1896, p. 908; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 203 (1903); Robinson, Journ. Fed. Malay States Mus. i, p. 30 (1905).

Snout pointed, longer than the orbit; canthus rostralis strong; loreal region nearly vertical, slightly concave; nostril nearer tip of snout than eye; interorbital space broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye. Fingers free, toes half-webbed; disks large, but smaller than the tympanum; subarticular tubercles moderate; a small, very feebly prominent inner metatarsal tubercle. The tibio-tarsal articulation reaches the end of the snout or a little beyond. Upper parts rough with small granular tubercles; throat smooth, belly coarsely granulate. Light brown or bright reddish orange above, head, body, and limbs with cream-coloured, dark-edged spots; belly white, with or without blotches of greenish black. Iris golden in its upper half, bronze-brown in its lower half.

From snout to vent 35 millim.

Malay Peninsula and Borneo. Obtained on Bukit Timah, Singapore, by Dr. Hanitsch, and in the Larut Hills, Perak, at 4000 feet altitude, among dead leaves, by Mr. Butler, and on Gunong Angsi, Negri Sembilan, at 2600 feet.

273. *Ixalus asper*.

Bouleng. P. Z. S. 1886, p. 415, pl. xxxix, fig. 1; W. Slater, P. Z. S. 1892, p. 347; Bouleng. Ann. Mus. Civ. Genova (2) xiii, p. 37 (1893); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 204 (1903).

Snout rounded, as long as the orbit; canthus rostralis very feebly marked; loreal region oblique, concave; nostril nearer tip of snout than eye; interorbital space broader than the upper eyelid; tympanum very distinct, nearly as large as the eye.

Fingers free, toes $\frac{3}{4}$ or nearly entirely webbed; disks large, but smaller than the tympanum; subarticular tubercles weak; a small, very feebly prominent inner metatarsal tubercle. The tibio-tarsal articulation reaches the tip of the snout. Upper parts rough with small conical, granular tubercles; throat smooth, belly coarsely granulate. Blackish, 'the granules' on the upper parts appearing as white dots, or ashy grey with a large square or triangular dark brown marking on the back, a cross-bar between the eyes, and cross-bars on the limbs; throat black, belly and lower surface of limbs marbled black and bluish grey.

From snout to vent 35 millim.

Discovered in the Larut Hills, Perak, at 3300 feet elevation, by Mr. L. Wray, and rediscovered in the same hills, between 3500 and 4000 feet, by Mr. A. L. Butler. Has also been found on Bukit Itam, Selangor, 3000 feet, by Mr. Robinson. Further known from the Karin Hills in Burma and the hills between Burma and Siam.

274. *Ixalus horridus*.

Boulenger, Fascic. Malay., Zool. i, p. 139, pl. vi, fig. 2 (1903).

Head rather strongly depressed, the obtusely pointed snout a little longer than the orbit; canthus rostralis obtuse; loreal region concave; nostril close to the end of the snout; inter-orbital space a little narrower than the upper eyelid; tympanum distinct, as large as the eye. Fingers half-webbed, with large disks which are broader than long and as broad as the tympanum; toes webbed to the disks, which are smaller than those of the fingers; subarticular tubercles very small; a small, oval inner metatarsal tubercle. The tibio-tarsal articulation reaches between the eye and the tip of the snout. Upper parts with very prominent, irregular large warts, themselves studded with granular asperities in the adult; throat, breast, lumbar and antero-femoral region and lower surface of limbs smooth; belly and anal region with large flat granules. Dark warm-brown above, with rather indistinct blackish spots on the body and regular cross-bars on the limbs; the granular asperities greyish; a large black lumbar spot; webs blackish; lower parts blue-grey, largely spotted and marbled with black. Male with a large soft pad on the inner side of the first finger and an internal vocal sac.

From snout to vent 40 millim.

The tadpole has the body much depressed; eyes superior. The mouth has a circular lip as in *Rana*, the sides and lower edge fringed with papillæ; upper lip with a long series of fine horny teeth, followed on each side by 3 series; 3 interrupted series of teeth on the lower lip. Spiraculum sinistral, anus dextral. Tail $2\frac{2}{3}$ to 3 times as long as deep, rounded at the end, the upper crest not extending on the body. Uniform dark brown or blackish, with whitish lines of sensory organs. Length up to 50 millim.

A considerable number of adults were discovered by Messrs. Annandale and Robinson in a tree in the jungle on Bukit Besar. The tree was one of those from the lower part of the trunk of which large buttresses project, and the buttresses had coalesced in pairs, forming cavities containing several gallons of rain-water and dead leaves. The frogs deposit their pigmentless eggs on the trunk in frothy masses about the size of a cricket-ball, a foot or two above the surface of the water in these cavities. The eggs are washed down by the rain into the water within three or four days, otherwise the froth dries up and the eggs perish.

This frog bears a striking resemblance to *Rhacophorus leprosus*, and the habits of the two appear to be identical.

Family ENGYSTOMATIDÆ.

Jaws toothless; diapophyses of sacral vertebra dilated.

Africa, Eastern Asia, New Guinea, America.

Four genera in the Malay Peninsula.

Synopsis of the Genera.

- | | |
|--|----------------------|
| I. Præcoracoids present; digits not dilated at the end; tympanum usually distinct. | CALOPHRYNUS, p. 257. |
| II. No præcoracoids; digits more or less dilated at the end; tympanum hidden. | |
| Tongue elliptic; palatine bones not forming a sharp ridge | MICROHYLA, p. 258. |
| Tongue elliptic or pyriform; palatine bones forming a sharp ridge across palate | CALLULA, p. 263. |
| Tongue cordiform | PHRYNELLA, p. 265. |

Genus CALOPHRYNUS.

Tschudi, N. Class. Batr. p. 86 (1838).

Pupil horizontal. Tongue elliptic, entire and free behind. A more or less distinct dermal ridge across the palate behind the choanæ, and two others in front of the œsophagus, the posterior always and the others sometimes denticulated. Tympanum usually distinct. Fingers free; toes webbed at the base, the tips not dilated into regular disks. Outer metatarsals united. Præcoracoids weak, parallel to the broad coracoids; omosternum and sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated.

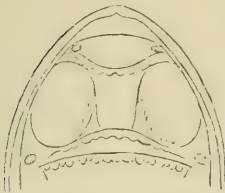


Fig. 72.—Palate of *Calophrynus pleurostigma*.

Southern China, CochinChina, Burma, Siam, Malay Peninsula and Archipelago; Madagascar.

A single species in the Malay Peninsula.

275. *Calophrynus pleurostigma*.

Tschudi, l. c. ; Bouleng. Cat. Batr. Ecaud. p. 158 (1882) ; id. Faun. Brit. Ind., Rept. p. 490 (1890) ; S. Flower, P. Z. S. 1896, p. 908, and 1899, p. 900 ; Bouleng. Journ. Fed. Malay States Mus. iii, p. 62 (1908).
Bufo studei, Isenschmidt, Mitth. Nat. Ges. Bern, 1903, p. 14, pl. v, fig. 2.

Snout prominent, truncate ; canthus rostralis angular ; loreal region vertical ; tympanum nearly as large as the eye, rarely hidden under the granulate skin. Fingers short, first a little shorter than second ; toes short ; tips of fingers and toes slightly swollen ; subarticular tubercles very prominent ; two rounded, more or less distinct metatarsal tubercles. The tarso-metatarsal articulation reaches the shoulder or the eye. Skin of the back smooth or granular, very thick, glandular ; belly and lower surface of thighs coarsely granular ; a more or less distinct lateral fold, commencing from the eye. Brown or reddish above, with or without longitudinal dark spots or bands converging on the head ; a dark, light-edged round spot on the loin ; sides of body, throat, and breast dark brown ; limbs usually with dark cross-bands, thighs sometimes bright crimson on the sides. Male with an internal vocal sac.

From snout to vent 47 millim.

Southern China, Tonkin, Burma, Siam, Malay Peninsula, Sumatra, Natuna Islands, Borneo. Recorded only from Johore, Pahang, Selangor, and Singapore.

Mr. Robinson makes the following remarks about specimens observed by him on Gunong Tahan, alt. 3000 feet :—

“ Though only a single specimen of this frog was obtained, it was probably anything but rare, as its peculiar note, which is more like that of an insect than a batrachian, was constantly heard in the evening after rain. The species lives in small holes in tree-trunks, often at a considerable height from the ground, and is to be secured by dropping salt into the water with which the hole is generally filled, when the frog will rise to the surface.”

Genus **MICROHYLA**.

Tschudi, N. Class. Batr. p. 71 (1838).

Pupil round. Tongue elliptic, entire, free behind. One or two dermal ridges in front of the œsophagus. Tympanum hidden. Fingers free ; toes free or more or less webbed ; tips of fingers and toes more or less dilated. Outer metatarsals united. No præcoracoids ; no omosternum ; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated.

China and South-Eastern Asia.

Seven species are known from the Malay Peninsula.

Synopsis of the Species.

I. Toes free or webbed at the base.

A. Snout shorter than orbit; a single metatarsal tubercle.

Toes quite free, the tips dilated into very small disks; tibio-tarsal articulation reaching the temple or the eye *M. inornata*, p. 259.

Toes webbed at the base, the tips dilated into well-developed disks; tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout *M. leucostigma*, p. 260.

B. Snout at least as long as orbit; two metatarsal tubercles.

Toes with a very slight rudiment of web, the tips simply swollen or very feebly dilated; tibio-tarsal articulation not reaching beyond eye *M. ornata*, p. 260.

Toes webbed at the base, the tips dilated into small but very distinct disks; tibio-tarsal articulation reaching the eye *M. butleri*, p. 261.

Toes webbed at the base, the tips dilated into small but very distinct disks; tibio-tarsal articulation reaching tip of snout or beyond. *M. achatina*, p. 261.

II. Toes at least half-webbed, the tips dilated into rather large disks; tibio-tarsal articulation reaching beyond tip of snout.

Toes half-webbed; a single metatarsal tubercle. *M. annectens*, p. 262.

Toes webbed to the disks; two metatarsal tubercles *M. berdmorei*, p. 263.

276. *Microhyla inornata*.

Bouleng. P. Z. S. 1890, p. 37; S. Flower, P. Z. S. 1899, p. 905; Laidlaw, P. Z. S. 1900, p. 887.

Habit moderately slender. Snout obtuse, shorter than the orbit. Fingers and toes moderately elongate, the tips dilated into very small disks; first finger much shorter than second; toes quite free; subarticular tubercles very distinct; a very small, round inner metatarsal tubercle. The tibio-tarsal articulation reaches the temple or the eye; tibia $\frac{2}{5}$ to $\frac{1}{2}$ length of head and body. Back smooth or with small smooth warts. Grey or dark brown above, spotted or marbled with black, the spots sometimes forming longitudinal stripes; sides of head black, with a series of white spots on the upper lip, sometimes confluent into a streak; lower parts brown or spotted with brown; throat of male blackish. Male with an internal vocal sac.

Total length 23 millim.

First described from Sumatra, this small frog has since been recorded from Borneo, Burma, and Siam. Specimens were obtained by the Skeat Expedition on Bukit Goah, near Biserat, in Jalor, and Dr. Werner has sent me one from Perak.

277. *Microhyla leucostigma*.

Bouleng. Ann. & Mag. Nat. Hist. (7) iii, p. 275, pl. xii, fig. 1 (1899);
S. Flower, P. Z. S. 1899, p. 905; A. L. Butler, Journ. Nat. Hist.
Soc. Bombay, xv, p. 388 (1904).

Habit moderately slender. Snout rounded, shorter than the orbit. Fingers and toes rather short, the tips dilated into small but very distinct disks; first finger much shorter than second; toes with a slight rudiment of web; subarticular and inner metatarsal tubercles flat, very feebly prominent. Tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout; tibia $\frac{1}{2}$ length of head and body. Skin smooth. Colour in life intense iridescent black above, with very small scattered bluish-white spots, which increase in size towards the sides and in the anal region; upper surface of limbs reddish brown, with black cross-bands, and thickly studded with very small white spots; hands and feet with bright yellow spots; below very rich dark brown, blacker on the throat, redder on the belly and thighs, nearly covered with large very distinctly defined spots of intense yellow, the ground colour appearing as a dark network between them. Iris very dark brown, very minutely spotted with pale gold.

From snout to vent 27 millim.

Discovered in the Larut Hills, Perak, altitude 3500 feet, by Capt. Flower; has also been found in Borneo. A pair were caught pairing; the embrace was axillary, and the fingers of the male did not meet on the breast of the female.

278. *Microhyla ornata*.

Engystoma ornatum, Dum. & Bibr. Exp. Gén. viii, p. 745 (1841).

Diplopelma ornatum, Günth. Rept. Brit. Ind. p. 417 (1864).

Microhyla ornata, Bouleng. Cat. Batr. Ecaud. p. 165 (1882); id.
Faun. Brit. Ind., Rept. p. 491 (1890); S. Flower, P. Z. S. 1899,
p. 901, pl. lx, fig. 1; Laidlaw, P. Z. S. 1900, p. 887.

Habit moderately slender. Snout obtuse, as long as orbit or a little longer. Fingers rather slender, first much shorter than second; toes rather slender, with a slight rudiment of web; tips of fingers and toes simply swollen or dilated into very small disks; subarticular tubercles very distinct; two small but prominent, subequal metatarsal tubercles. The tibio-tarsal articulation reaches the eye, or between the shoulder and the eye; tibia $\frac{1}{2}$ or a little less than $\frac{1}{2}$ as long as head and body. Skin smooth. Reddish or greyish olive above, with a large dark marking on the back, beginning between the eyes and widening as it extends to the hind part of the body; on each side of this marking wavy dusky lines often present; a dark band along the side of the head and body; limbs with dark cross-bars; throat and breast generally greyish or brownish, dotted with white; the remainder of the lower parts whitish, unspotted. Iris golden, speckled with bronze. Male with a large subgular vocal sac.

From snout to vent 28 millim.

The tadpole is transparent and almost colourless. Spiraculum and anus median; eyes perfectly lateral; mouth without hard beak, labial teeth, or papillæ, with a simple upper lip and a contractile lower one; tail ending in a very fine point. The feet are for a time completely webbed, the web disappearing when the young leave the water. Total length 20 millim.

Cashmir, India and Ceylon, Southern China to Malay Peninsula. Known from Penang, Kedah, Jalor, and Kelantan.

According to Flower, this very active, elegant frog is to be found hiding during the day under stones, logs, &c., in the crevices in the mud in dried-up pools, and among dead leaves. It comes out at dark and seems to remain abroad all night. The males have a loud croak.

279. *Microhyla butleri*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 188 (1900); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 388 (1904).

Habit slender. Snout rounded, as long as the orbit. Fingers and toes rather slender, the tips dilated into small but well-developed disks; first finger much shorter than second; toes webbed at the base; subarticular tubercles small; two very small metatarsal tubercles. The tibio-tarsal articulation reaches the eye; tibia $\frac{1}{2}$ length of head and body. Skin smooth or with small smooth warts above. Grey on the back, pale reddish on the sides and limbs, with symmetrical dark brown markings forming bars on the limbs; some small scarlet spots on the sides, a whitish oblique streak from the eye to the base of the fore limb and a whitish spot on the end of the snout; whitish beneath, throat and breast speckled with dark brown.

From snout to vent 26 millim.

Described from a single specimen, obtained by Mr. A. L. Butler in the Larut Hills, Perak, at 4000 feet elevation, along with the type of *M. annectens*. The same species has since been re-discovered in the Man-Son Mountains, Tonkin, between 3000 and 4000 feet.

280. *Microhyla achatina*.

Hylaplesia achatina, Boie, Isis, 1827, p. 294.

Microhyla achatina, Tschudi, N. Class. Batr. p. 71 (1838); Bouleng. Cat. Batr. Ecaud. p. 166 (1882); S. Flower, P. Z. S. 1899, p. 906; Laidlaw, P. Z. S. 1900, p. 888.

Habit slender. Snout subacuminate, as long as or a little longer than the orbit. Fingers rather slender, first much shorter than second, the tips swollen into very small disks; toes slender, webbed at the base, the tips dilated into well-developed disks; subarticular tubercles distinct; two small metatarsal tubercles.

The tibio-tarsal articulation reaches the tip of the snout, or a little beyond; tibia $\frac{1}{2}$ to $\frac{2}{5}$ length of head and body. Skin smooth. Brown or reddish above, with dark brown spots or symmetrical markings, or with rather indistinct chevron-shaped darker and lighter lines; a light vertebral line sometimes present; sides of head and body dark brown or black; limbs with more or less distinct dark and light cross-bars; anal region blackish; lower parts purplish buff. Iris golden. Male with a subgular vocal sac.

From snout to vent 23 millim.

Tonkin, Tenasserim, Siam, Malay Peninsula, Sumatra, Java, Moluccas. Recorded from Penang, Perak, Rhaman, Kedah, Kelantan, and Malacca.

Flower describes this as a very active frog, at times taking very sudden, long hops like a grasshopper, at others using its dilated digits in climbing like a true tree-frog.

281. *Microhyla annectens*.

Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 188 (1900); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 389 (1904).

Habit slender. Snout rounded, as long as the orbit. Fingers and toes moderately slender, the tips dilated into rather large disks; first finger much shorter than second; toes half-webbed; subarticular tubercles feebly prominent; a very small inner metatarsal tubercle. Hind limb remarkably long; the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia $\frac{2}{3}$ length of head and body. Skin smooth. Brown or pinkish above, with symmetrical blackish light-edged markings, a large one on the back being produced to between the eyes, where it expands into a transverse bar; side, from the shoulder to the lumbar region, black, with sharply defined upper outline; an oblique whitish streak from the eye to the base of the fore limb; a blackish spot at the knee, a dark cross-bar on the thigh, another on the femur, and a third on the tarsus; lower parts whitish, or closely marbled with dark brown.

From snout to vent 18 millim.

This frog was discovered by Mr. A. L. Butler on the edge of a small pond in jungle on the Larut Hills, at about 4000 feet elevation; it has also been found at the entrance of the Batu Caves, Selangor. It is diurnal and a good swimmer. It has recently been recorded from Java by Van Kampen, in M. Weber's Zool. Ergebn. iv, p. 404 (1907), and a specimen from the Kidi District, Sarawak, presented by Mr. C. J. Brooks, is in the British Museum.

282. *Microhyla berdmorei*.

Engystoma ? *berdmorei*, Blyth, Journ. Asiat. Soc. Bengal, xxiv, p. 720 (1855).

Microhyla berdmorei, Bouleng. Cat. Batr. Ecaud. p. 166 (1882); id. Faun. Brit. Ind., Rept. p. 492 (1890); S. Flower, P. Z. S. 1899, p. 906; Laidlaw, P. Z. S. 1900, p. 888; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 390 (1904).

Habit slender. Snout subacuminate, as long as or a little longer than orbit. Fingers rather slender, first much shorter than second, the tips swollen into very small disks; toes long, webbed to the tips, which are dilated into rather large disks; sub-articular tubercles very distinct; two very small metatarsal tubercles. The tibio-tarsal articulation reaches beyond the tip of the snout; tibia $\frac{2}{3}$ as long as head and body. Skin smooth, or with a few scattered tubercles on the back and sides. Brownish, olive, or pinkish above; a darker, light-edged, hourglass-shaped large spot on the head and anterior part of the back, beginning between the eyes, sometimes continued on the hind part of the back; black spots on the sides of the limbs and occasionally on the flanks; a chevron-shaped black marking on the anal region; throat and breast clouded with brown, the remainder of the lower surface whitish. Male with an internal vocal sac.

From snout to vent 45 millim.

Burma, Siam, Malay Peninsula, Sumatra. Recorded from Perak and Legoh.

Flower describes this frog as nocturnal, frequenting the neighbourhood of water, and an extraordinarily good jumper.

Genus **CALLULA**.

Gray, Zool. Miscell. p. 38 (1831).

Pupil round. Tongue oblong, entire and free behind. Palatine bones forming a sharp, sometimes toothed ridge across the palate; two dermal, more or less denticulated ridges across the palate, in front of the oesophagus. Tympanum hidden. Fingers free; toes free or webbed; tips of fingers and toes more or less dilated. Outer metatarsals united. No præcoracoids; no omosternum; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated.

China and South-Eastern Asia. A single species in the Malay Peninsula.

283. *Callula pulchra*.

Gray, I. c.; Günth. Rept. Brit. Ind. p. 437 (1864); Bouleng. Cat. Batr. Ecaud. p. 170 (1882); id. Faun. Brit. Ind., Rept. p. 494 (1890); S. Flower, P. Z. S. 1896, p. 908, and 1899, p. 906; Laidlaw, P. Z. S. 1900, p. 888; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 390 (1904).

Hyladactylus bivittatus, Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1064 (1847).

Snout short, rounded, as long as or shorter than the orbit. Fingers rather slender, first shorter than second, the tips dilated into well-developed truncated disks; toes moderate, slightly webbed at the base, the tips swollen; subarticular tubercles well developed; two metatarsal tubercles, inner large, compressed, with rather sharp edge. The tarso-metatarsal articulation reaches the axil, the shoulder, or a little beyond. Skin smooth, or back with flat smooth tubercles; a fold from the eye to the shoulder, and another, more or less distinct, across the head behind the eyes. Yellow or pink above, usually with a large rich dark brown spot covering nearly the whole of the back, and a dark lateral stripe; sometimes with irregular yellowish spots on the back; a



Fig. 73.—*Callula pulchra*.

faint black vertebral line may be present; limbs grey, mottled with dark brown, and with more or less distinct yellow spots: dirty buff below, chin and throat black in the male. Male with an external subgular vocal sac.

From snout to vent 75 millim.

India, Ceylon, and Southern China to the Malay Peninsula. Very locally distributed in the Peninsula; known from Jalor, Selangor, Kelantan, Trengganu, Malacca, and Singapore. Probably introduced into the southern portions of the Peninsula, as it is only found in large towns. Known as the "Bull-frog" by the English in Singapore, and detested for the noise it makes at

night, the males' croak being very loud and audible at a considerable distance. The males croak while floating on the surface of the water, the head and inflated sides of the body just above the surface, the vocal sac swollen out like a globe and the limbs extended. They can hop well on land, and are probably good burrowers, as the shape of the inner metatarsal tubercle indicates. Feeds on insects, chiefly termites. When pairing, the embrace is axillary: the eggs are expelled in masses of the size of a cherry and the development is very rapid. The fully developed tadpole has not been described.

Genus **PHRYNELLA.**

Bouleng. Ann. & Mag. Nat. Hist. (5) xix, p. 346 (1887).

Pupil horizontal, Tongue cordiform, free behind. Vomerine teeth none. No ridges across the palate. Tympanum hidden. Fingers free, toes extensively webbed; tips of fingers and toes dilated; outer metatarsals united. No præcoracoids; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated.

Two species :—

Toes at least three fourths webbed; subarticular tubercles of fingers large and flattish	<i>P. pulchra</i> ,
Toes hardly half-webbed; subarticular tubercles very large and prominent; male with a strong tubercle-like rudiment of pollex	[p. 265.
	<i>P. pollicaris</i> ,
	[p. 266.

284. **Phrynella pulchra.**

Bouleng. t. c. pl. x, fig. 2 (1887); Isenschmidt, Mitth. Naturf. Ges. Bern, 1903, p. 12, pl. v, fig. 1.

Habit stout. Head small, with short, truncate, projecting snout; interorbital space much broader than upper eyelid. Fingers depressed, dilated into large subtriangular disks; first finger shorter than second; subarticular tubercles very large and flat. Toes three fourths or nearly entirely webbed, feebly dilated at the end; a small, oval, flat inner metatarsal tubercle. The tibiotarsal articulation reaches the temple or nearly the posterior border of the eye. Skin smooth, or with small flat warts on the sides and hinder part of the back. Brown above, with symmetrical darker spots, some of which are edged with a pink line; throat and lower surface of foot brown; belly, groin, and hinder side of thighs yellowish; vent in a large dark brown spot, separated from the dark colour of the back and the upper surface of the thighs by a band of the yellowish colour of the lower surface. Male with an internal gular vocal sac.

From snout to vent 42 millim.

First described from Malacca. Has since been found in Sumatra and the Mentawai Islands.

285. *Phrynella pollicaris*.

Phrynella pulchra (non Bouleng.) Günth. Ann. & Mag. Nat. Hist. (5) xx, p. 313, pl. xvi, fig. B (1887).

Phrynella pollicaris, Bouleng. P.Z. S. 1890, p. 37; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 392 (1904).

Distinguished from the preceding by a stouter habit, a shorter head, shorter and thicker digits with much stronger and very prominent subarticular tubercles, hardly half-webbed toes, and by the presence, in the male, of a strong, tubercle-like rudiment of pollex. Colour in life, according to Mr. Wray, dark olive-brown above; an oblique yellow line from the eye to the angle of the mouth; a pale olive-yellow mark across forehead, through the eyes, and down the sides of the body to the thighs, this band minutely spotted with dark brown, principally along the centre; a triangular dark-centred pale mark on the anal region; limbs with pale cross-bands; throat of male dark brown, passing into yellow on the breast; belly brown, spotted with whitish. Iris red-brown. The colour is very changeable, passing to blackish or yellowish.

From snout to vent 34 millim.

Inhabit the hills of Perak, from 3000 feet upwards, living in holes in trees which are so situated as to contain more or less rain-water. They have a loud, flute-like, musical note, which they utter at irregular intervals, principally during the night. They blow themselves out with air, and look more like bladders than anything else. When inflated they float on the surface of the water, and will remain motionless for a long time with legs and arms stretched out.

This frog has also been found in Sumatra and Borneo.

Series B. **ARCIFERA.**

Family **BUFONIDÆ.**

Jaws toothless ; diapophyses of sacral vertebra dilated.

The family of true Toads, which is cosmopolitan (except Madagascar), is represented in the Malay fauna by three genera :—

- | | |
|---|----------------------|
| Fingers webbed, the tips dilated into disks ;
nostrils lateral | NECTOPHRYNE, p. 268. |
| Fingers free, not dilated into disks ; nostrils
lateral | BUFO, p. 269. |
| Fingers free or webbed at the base, pointed ;
nostrils directed upwards, on upper surface of
snout..... | NECTES, p. 275. |

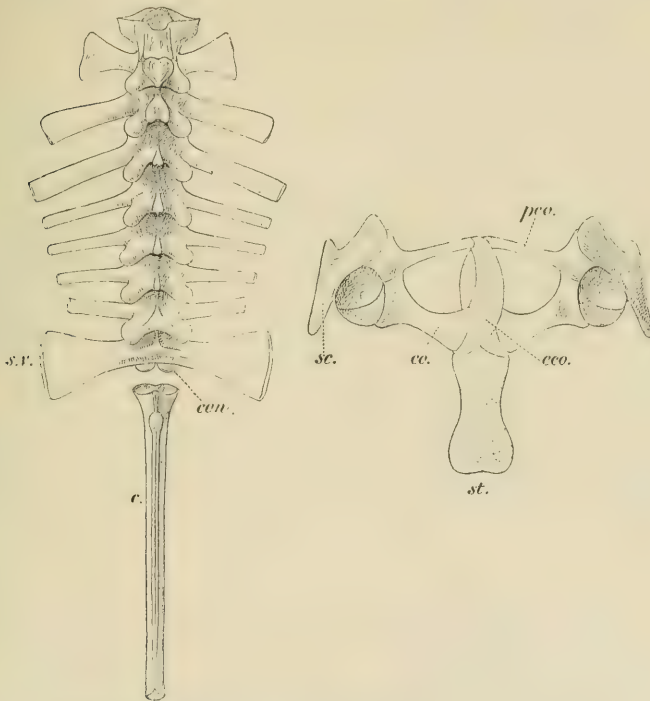


Fig. 74.—Vertebral column and pectoral arch of *Bufo asper*.

- | | | |
|------------------------------|--------------------------|------------------------------|
| <i>c.</i> Coceyx. | <i>cco.</i> Epicoracoid. | <i>st.</i> Sternum. |
| <i>co.</i> Coracoid. | <i>pre.</i> Præcoracoid. | <i>s.v.</i> Sacral vertebra. |
| <i>con.</i> Sacral condyles. | <i>sc.</i> Scapula. | |

Genus **NECTOPHRYNE**.

Buchh. & Peters, Mon. Berl. Ac. 1875, p. 202.

Pupil horizontal. Tongue elliptical, entire and free behind. Tympanum distinct or hidden. Fingers and toes webbed, the tips dilated into disks. Outer metatarsals united. No omosternum; sternum cartilaginous.

Tropical Africa, Seychelles, India, and Malay Peninsula and Archipelago. Two species in the Malay Peninsula:—

Inner finger rudimentary; no tarsal fold *N. guentheri*, p. 268.
 Inner finger well developed; a tarsal fold *N. hosii*, p. 268.

286. **Nectophryne guentheri**.

Bouleng. Cat. Batr. Ecaud. p. 280 (1882); S. Flower, P. Z. S. 1896, p. 910; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 394 (1904); Roux, P. Z. S. 1906, i, p. 62.

Habit slender. Head small; snout obliquely truncate; loreal region vertical; interorbital space broader than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye. Fore limb very slender. Fingers moderate, much depressed, $\frac{1}{3}$ webbed, the web extending as a margin to the tips, which are broad and truncate; first finger rudimentary, hardly half as long as second; toes rather short, the web extending to the tips, but deeply emarginate; the tips dilated like those of the fingers; subarticular tubercles small; two small, flat metatarsal tubercles; no tarsal fold. The tarso-metatarsal articulation reaches the tip of the snout or beyond. Skin covered with small tubercles. Olive-brown above, spotted with yellow and blackish; lower parts yellowish, throat and belly spotted with brown or blackish.

From snout to vent 30 millim.

Known from Borneo, the Natuna Islands, Bukit Timah, Singapore, where several specimens have been found by Mr. H. N. Ridley and Capt. Flower, and the lower hills of Selangor, where it is by no means uncommon.

287. **Nectophryne hosii**.

Bouleng. P. Z. S. 1892, p. 508, pl. xxx, fig. 2; Robinson, Journ. Fed. Malay States Mus. i, p. 19 (1905); Roux, P. Z. S. 1906, i, p. 59, pl. ii, fig. 1.

Habit stout, but limbs rather thin. Head concave above; snout truncate; loreal region slightly oblique, concave; interorbital space twice as broad as the upper eyelid; tympanum very distinct, about half the diameter of the eye. Fingers moderate,

much depressed, webbed at the base, the web extending as a margin to the tips, which are broad and truncate; first finger shorter than second; toes rather short, nearly entirely webbed, the disks a little smaller than those of the fingers; subarticular tubercles small, feebly prominent; two flat metatarsal tubercles, inner the larger; a tarsal fold. The tarso-metatarsal articulation reaches the tip of the snout, or not quite so far. Above with small scattered warts, beneath finely granulate; a short but very prominent parotoid gland. Male uniform brown, with indistinct spots or cross-bands on the limbs, or dark brown with lighter markings which may form indistinct, coarse vermiculations; belly brown or whitish; throat dark brown or blackish. Female black above, with bright yellow spots or vermiculations, or greenish olive with bright chrome-yellow round spots on the sides and beneath.

From snout to vent, male 65 millim., female 98.

The largest species of the genus.

Borneo and Malay Peninsula, where Mr. Robinson captured two specimens, male and female, in a tree in deep jungle about nine miles from Kuala Lumpur. The pairing and oviposition are the same as in *Bufo melanostictus*, the eggs forming long strings.

Genus **BUFO.**

Laurenti, Syn. Rept. p. 25 (1768).

Pupil horizontal. Tongue elliptic or pyriform, entire and free behind. Tympanum distinct or hidden. Fingers free; toes more

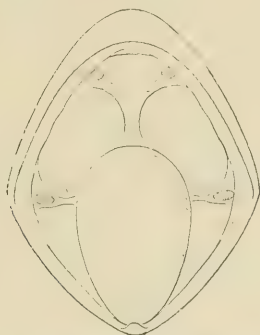


Fig. 75.—Open mouth of *Bufo asper*.

or less webbed. Outer metatarsals united. A large gland (parotoid) often present behind the eye. No omosternum; sternum cartilaginous or calcified.

Cosmopolitan, except Australia and Madagascar.

Seven species in the Malay Peninsula.

Synopsis of the Species.

I. No bony ridges on the head; habit slender; parotoids absent or very small.

Tibio-tarsal articulation reaching eye or between eye and tip of snout; tibia $\frac{1}{2}$ length of head and body

[p. 270.]

B. penangensis,

Tibio-tarsal articulation reaching far beyond tip of snout; tibia $\frac{2}{3}$ length of head and body

B. jerboa, p. 271.

II. Bony ridges on the head; body stout; parotoids very distinct.

A. Orbital and orbito-tympanic, but no parietal ridges.

Tarso-metatarsal articulation reaching tip of snout or beyond; toes completely webbed; tympanum about $\frac{1}{3}$ diameter of eye

B. asper, p. 271.

Tarso-metatarsal articulation not reaching beyond eye; toes incompletely webbed; tympanum at least $\frac{2}{3}$ diameter of eye

[p. 272.]

B. melanostictus,

B. Supraorbital ridges continued on the parietal region and straight.

Tarso-metatarsal articulation reaching beyond eye; parotoids short, round or subtriangular . .

B. parvus, p. 274.

Tarso-metatarsal articulation not reaching beyond eye; parotoids long and narrow

[p. 274.]

B. quadriporcatus,

C. Supraorbital ridges continued on the parietal region and forming an angle; tarso-metatarsal articulation reaching tip of snout or beyond

B. divergens, p. 275.288. *Bufo penangensis*.

Ansonia penangensis, Stoliczka, Journ. Asiat. Soc. Bengal, xxxix, p. 152, pl. ix, fig. 4 (1870).

Bufo penangensis, Bouleng. Cat. Batr. Ecaud. p. 287 (1882); S. Flower, P. Z. S. 1896, p. 911, and 1899, p. 908, pl. lx, fig. 3; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 395 (1904).

Habit slender. Crown without bony ridges; snout obliquely truncate, strongly projecting beyond the mouth; loreal region vertical; interorbital space as broad as upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye, close to latter. Fingers rather long and slender, with feebly swollen tips, first shorter than second, without or with very indistinct subarticular tubercles; toes short, $\frac{1}{2}$ to $\frac{2}{3}$ webbed, without or with very indistinct subarticular tubercles; two flat metatarsal tubercles; no tarsal fold. The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout; tibia about $\frac{1}{2}$ length of head and body. Upper parts with unequal sized small warts, lower granulate; no distinct parotoids. Dark brown above, with yellowish spots or symmetrical markings, forming oblique bars across the limbs;

brownish beneath, speckled with yellow, or marbled with brown. Male with a large external gular vocal sac.

From snout to vent 40 millim.

Tadpoles, living in the swift-flowing hill-streams, remarkable for their large lips forming a sucking-disk with two upper and three lower uninterrupted series of minute horny teeth; beak white, lower jaw edged with black, upper with a conspicuous black diagonal mark on each side. Tail acutely pointed, upper crest only on posterior two thirds. Spiraculum sinistral; anus median. Sepia-brown above, mottled darker and lighter. Total length 34 millim.

This little toad, which occurs also in Borneo, has been found in the hills of Penang (2000 ft.) and Perak (2000-3000 ft.).

289. *Bufo jerboa*.

Bouleng. P. Z. S. 1890, p. 328, pl. xxv, fig. 3; Laidlaw, P. Z. S. 1900, p. 889.

Habit very slender. Crown without bony ridges; snout obliquely truncate, strongly projecting beyond the mouth; loreal region vertical; interorbital space as broad as or a little narrower than the upper eyelid; tympanum very distinct, $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye, close to latter. Fingers long and slender, with feebly swollen tips, first as long as or a little shorter than second, with very prominent subarticular tubercles; toes short, $\frac{1}{3}$ to $\frac{1}{2}$ webbed, with very prominent subarticular tubercles; two small but prominent metatarsal tubercles; a tarsal fold. The tibio-tarsal articulation reaches far beyond the tip of the snout; tibia about $\frac{2}{3}$ length of head and body. Upper parts with granules and very small warts; lower granulate; parotoids, if at all distinct, very narrow. Brown above, with dark and light spots or symmetrical markings, often forming an X-shaped figure in front of the sacral region; a yellowish dorso-lateral streak sometimes present; dark bars on the limbs and on the lips; yellowish or pale brownish beneath, throat and breast dark brown or much mottled with dark brown.

From snout to vent 50 millim.

Borneo, Gunong Inas, N. Perak, where a single specimen was obtained by the Skeat Expedition, and vicinity of the Batu Caves, near Kuala Lumpur, Selangor.

290. *Bufo asper*.

Gravenh. Delic. Mus. Zool. Vratisl. p. 58 (1829); Günth. Rept. Brit. Ind. p. 423 (1864); Bouleng. Cat. Batr. Ecaud. p. 313 (1882); id. Faun. Brit. Ind., Rept. p. 507 (1890); S. Flower, P. Z. S. 1896, p. 912, and 1899 p. 912; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 396 (1904).

A broad supraorbital and a thick orbito-tympanic bony ridge; snout short, obliquely truncate; canthus rostralis angular; loreal

region vertical; interorbital space broader than the upper eyelid; tympanum distinct, $\frac{1}{3}$ diameter of eye. First finger not extending beyond second; toes entirely webbed, with single subarticular tubercles; two moderate metatarsal tubercles; a tarsal fold. The tarso-metatarsal articulation reaches the tip of the snout or beyond. Upper parts with very prominent, conical, spinose tubercles; parotoids very prominent, usually small, subtriangular or roundish. Uniform brown or blackish above, at certain seasons spotted with crimson; whitish beneath, uniform or spotted with black. Iris golden yellow, very finely speckled and vermiculated with very dark bronze.

From snout to vent 215 millim.

Tenasserim, Mergui, Malay Peninsula, Sumatra, Borneo, Java.

Widely but locally distributed in the Malay Peninsula, this toad, one of the largest Batrachians, is found in abundance in caves and in the neighbourhood of waterfalls, but seldom away from these particular haunts. It occurs at 4500 feet elevation in the Larut Hills, Perak, and on the Semangko Pass between Selangor and Pahang, at 2000 feet on Penang Hill. Abundant in the Batu Caves, Selangor, in places where no daylight ever penetrates, half a mile underground. Also known from Legeh, Jalor, Telubin, and Malacca. According to Annandale and Robinson, it is common at Bukit Besar, generally near human dwellings or in secondary jungle, occasionally penetrating into thick forest country. Young specimens, which are much lighter in colour than adults, are often found in large numbers on the banks of rapid mountain-streams, where they harmonize so well with the sand that they are difficult to detect except when in motion. According to Flower, this toad smells strongly of musk.

291. *Bufo melanostictus*.

Schneid. Hist. Amph. i, p. 216 (1801); Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1063 (1847); Günth. Rept. Brit. Ind. p. 422 (1864); Bouleng. Cat. Batr. Ecaud. p. 306 (1882); id. Faun. Brit. Ind., Rept. p. 505, fig. (1890); S. Flower, P. Z. S. 1896, p. 911, pl. xlv, fig. 3, and 1899, p. 910.

Head with more or less prominent bony ridges, viz. a canthal, a præorbital, a supraorbital, a postorbital, and a short orbito-tympanic; snout short, blunt; interorbital space much broader than the upper eyelid; tympanum very distinct, at least $\frac{2}{3}$ diameter of eye. First finger usually extending beyond second. Toes at least half-webbed, with single subarticular tubercles; two moderate metatarsal tubercles; no tarsal fold. Tarso-metatarsal articulation reaching tympanum or eye. Upper parts with more or less prominent, often spiny, warts; parotoids very prominent, reniform or elliptical, more or less elongate. Yellowish or brownish above, the spines of the warts and the ridges of the head usually black; beneath whitish, immaculate or more or less spotted. Male with

a subgular vocal sac, and black nuptial excrescences on the two inner fingers.

From snout to vent 115 millim.

Tadpole small (up to 23 millim.) and dark brown or blackish, belly and caudal crests grey. Tail rounded at end, both crests nearly equal in depth. Spiraculum sinistral; anus median. Beak white, edged with black; lips with papillæ only at the sides; in



Fig. 76.—*Bufo melanostictus*.

upper lip two series of fine teeth, upper uninterrupted; in lower lip three uninterrupted series of teeth.

India, Himalayas, and China to Malay Peninsula and Archipelago.

This toad is very common and generally distributed in the Malay Peninsula. Crepuscular and nocturnal, except during the breeding-season, which takes place in March and April, when

the spawn may be seen in ponds, in long strings twined about the water-weeds, exactly as in the common English toad, the habits of which are quite similar.

The Malay name of this and the preceding species is *katak puru*.

292. *Bufo parvus*.

Bouleng. Ann. & Mag. Nat. Hist. (5) xix, p. 346, pl. x, fig. 3 (1887); S. Flower, P. Z. S. 1899, p. 911; Laidlaw, P. Z. S. 1900, p. 888.

A supraorbital and a parietal bony ridge, forming together a straight line, and a short orbito-tympanic; snout very short, truncate, projecting considerably beyond the mouth; interorbital space as broad as or a little broader than the upper eyelid; tympanum very distinct, close to the eye and $\frac{2}{3}$ to $\frac{3}{4}$ diameter of latter. First finger extending considerably beyond second; toes hardly half-webbed, with simple subarticular tubercles; two rather strong metatarsal tubercles; no tarsal fold. The tarso-metatarsal articulation reaches between the eye and the end of the snout, or even a little beyond. Upper parts rough with very prominent, conical, often spinose tubercles; parotoids prominent, round or subtriangular, scarcely larger than the tympanum; lower parts with round tubercles of unequal size. Brown above, with a few darker spots, and often with a few scattered irregular spots of a beautiful pink; limbs with dark cross-bands; lower parts spotted with brown; throat brown in the male, which is provided with a subgular vocal sac and black nuptial asperities on the two inner fingers. Iris golden, speckled with black.

From snout to vent 50 millim.

Originally described from Malacca; has since been found widely distributed in the Malay Peninsula and in Burma and Sumatra.

293. *Bufo quadriporcatus*.

Bouleng. Ann. & Mag. Nat. Hist. (5) xix, p. 347, pl. x, fig. 4 (1887); Günth. op. cit. xx, p. 314, pl. xvi, fig. C (1887).

A straight, prominent supraorbital ridge, continued into a short parietal; a strong and broad orbito-tympanic ridge continuous with the parotoid, which is prominent and compressed, ridge-like; snout truncate, projecting far beyond the mouth; loreal region nearly vertical; interorbital space broader than the upper eyelid; tympanum very distinct, close to and nearly as large as or larger than eye. First finger extending beyond second; toes short, hardly half-webbed, with simple subarticular tubercles; two moderate metatarsal tubercles; no tarsal fold. The tarso-metatarsal articulation reaches the tympanum or the eye. Upper parts more or less warty; parotoids much elongate, usually followed by a lateral series of large tubercles; some specimens prickly all over with horny spines. Brownish above, uniform or marbled with olive;

the parotoids sometimes whitish, edged with black; limbs with dark cross-bands; lower parts whitish, uniform or marbled with brown.

From snout to vent 65 millim.

Malay Peninsula (Malacca, Perak Hills up to 800 feet), Sumatra, Borneo.

294. *Bufo divergens*.

Peters, Mon. Berl. Ac. 1871, p. 579; Bouleng. Cat. Batr. Ecaud. p. 312, fig. (1882); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 396 (1904).

Nearly allied to the preceding, but parietal bony ridge forming an angle with the supraorbital, and hind limb longer, the tarso-metatarsal articulation reaching the tip of the snout or beyond, and the tibia measuring half length of head and body. A yellow vertebral line sometimes present.

From snout to vent 50 millim.

Borneo, Natuna Islands, Selangor.

Genus **NECTES**.

Cope, Nat. Hist. Rev. 1865, p. 103.

Pupil horizontal. Tongue elliptical, entire and free behind. Nostrils directed upwards. Tympanum distinct. Fingers free or webbed at the base; toes fully webbed, the tips not dilated. Outer metatarsals united. No omosternum; sternum cartilaginous, ossified along the centre.

Malay Peninsula and Archipelago. A single species has to be dealt with in this fauna.

295. *Nectes subasper*.

Pseudobufo subasper, Tschudi, Class. Batr. p. 87 (1838).

Nectes subasper, Cope, l. c.; Bouleng. Cat. Batr. Ecaud. p. 327, fig. (1882); S. Flower, P. Z. S. 1899, p. 916; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 393 (1904).

Nectes pleurotenia, Fischer, Arch. f. Naturg. li, i, p. 47 (1885); Van Kampen, Zool. Jahrb., Syst. xxii, p. 711 (1905).

Nectes sumatranus, Werner, Zool. Jahrb., Syst. xiii, p. 497, pl. xxxv, fig. 9 (1900).

Head rather small; snout prominent, obliquely truncate; loreal region nearly vertical; nostrils small, valvular, close together on the upper surface near the tip of the snout; upper eyelid rather narrow; interorbital space broad; tympanum more or less distinct, $\frac{2}{3}$ to $\frac{3}{4}$ diameter of eye and close to latter. Fingers rather slender, obtuse or pointed, free, first shorter than second; toes pointed, united to the very tips by a very broad and thick membrane; no subarticular tubercles; two very indistinct, flat metatarsal tubercles; a rather indistinct tarsal fold. The tarso-

metatarsal articulation reaches between the shoulder and the eye. Upper parts covered with closely set smooth round warts of different sizes, the largest being distinctly porous; sides and lower parts granulate. Dark brown or blackish above, with or without a more or less distinct whitish or yellowish band along the side and the back of the thigh and metatarsus; a light brown vertebral stripe may be present; brownish white beneath, with or without minute dark dots; throat of male grey. Male with a large subgular vocal sac.

From snout to vent 150 millim.

Java, Borneo, Sumatra. Discovered by Mr. A. L. Butler on the banks of the little Sungei Buloh River in Selangor, above the reach of tidal influence, where this curious toad is not uncommon. Mr. Butler describes the habits as aquatic and arboreal. "They are usually found sitting on branches overhanging the water, into which they dive when disturbed. They are, as their fully webbed hind feet would lead one to suspect, powerful swimmers. When the males are croaking the blackish pouch under the throat is inflated to the size of a pigeon's egg. Their croak is generally uttered three or four times in very rapid succession and then followed by an interval of silence."

Family PELOBATIDÆ.

Upper jaw toothed; diapophyses of sacral vertebra very strongly dilated.

Europe, Southern Asia, New Guinea, North America.

Represented in the Malay Subregion by a single genus.

Genus MEGALOPHRYS.

Kuhl, Isis, 1822, p. 475.

Pupil erect. Tongue circular or pyriform, entire or nicked and free behind. Vomerine teeth in two small groups, if present. Tympanum distinct or hidden under the skin. Fingers free, toes free or shortly webbed; outer metatarsals united. Sternum with a bony style. Coccyx, if distinct from the sacral vertebra, with simple articulation.

South-Eastern Asia.

Seven species in the Malay Peninsula.

Synopsis of the Species.

- I. Profile of snout obliquely truncate, strongly projecting beyond lower jaw; canthus rostralis angular and loreal region vertical or slightly oblique; vomerine teeth usually present.

- A. Head at least once and a half as broad as long (to occiput); tibio-tarsal articulation not reaching eye; tympanum hidden or feebly distinct.
- End of snout without or with a mere indication of a dermal appendage; outer border of upper eyelid produced in the adult into a pointed appendage, which does not, as a rule, measure more than half diameter of eye *M. montana*, p. 277.
- Snout terminating in a pointed dermal appendage; outer border of upper eyelid produced into a pointed appendage, which is at least $\frac{2}{3}$ diameter of eye in adult *M. nasuta*, p. 279.
- B. Head once and one fourth as long as broad; tibio-tarsal articulation reaching beyond tip of snout; tympanum distinct; upper eyelid with a horn-like tubercle *M. longipes*, p. 280.
- II. Snout rounded or feebly truncate, not or but feebly projecting beyond lower jaw; no vomerine teeth.
- A. Tibio-tarsal articulation reaching eye or beyond; tympanum perfectly distinct.
- Tibio-tarsal articulation reaching tip of snout; snout rounded *M. gracilis*, p. 281.
- Tibio-tarsal articulation reaching eye; snout truncate *M. heteropus*, p. 281.
- Tibio-tarsal articulation reaching eye or between eye and nostril; snout rounded *M. pelodytoides*, p. 282.
- B. Tibio-tarsal articulation reaching shoulder; tympanum feebly distinct or hidden *M. hasseltii*, p. 282.

296. *Megalophrys montana*.

Kuhl, in Férussac, Bull. Sc. Nat. ii, p. 83 (1824); Bouleng. Cat. Batr. Ecaud. p. 442 (1882); Laidlaw, P. Z. S. 1900, p. 889; Annand. Fascic. Malay., Zool. i, p. 275 (1903); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 399 (1904); Bouleng. P. Z. S. 1908, p. 411.

Megalophrys montana, part., Günth. Rept. Brit. Ind. p. 413 (1864).

Megalophrys montana, var. *aceras*, Bouleng. Fascic. Malay., Zool. i, p. 131, pl. v, fig. 1 (1903).

Tongue entire or feebly nicked behind. Vomerine teeth usually present, in two widely separated small groups just behind the level of the choanæ. Head large, $1\frac{1}{2}$ to $1\frac{3}{4}$ times as broad as long, usually defined behind by a more or less distinct transverse fold; snout truncate or obtusely pointed, projecting beyond lower jaw, as long as or a little shorter than eye; canthus rostralis sharp; loreal region vertical or a little oblique, concave; interorbital space concave, its width $1\frac{1}{2}$ to 2 times that of upper eyelid; tympanum

usually feebly distinct, rarely hidden, its diameter $\frac{1}{2}$ to $\frac{2}{3}$ that of eye. Fingers obtuse or feebly swollen at the end, first as long as or a little longer than second; no subarticular tubercles; no distinct metacarpal tubercles. Toes rather short, obtuse or feebly swollen at the end, with a mere rudiment of web, or, at most, $\frac{1}{4}$ webbed; no subarticular tubercles; a flat, very indistinct inner metatarsal tubercle. Tibio-tarsal articulation reaching the shoulder, the commissure of the jaws, or the temple; tibia $\frac{3}{8}$ to $\frac{1}{2}$ length from snout to vent; foot as long as or shorter than tibia. Skin of upper parts smooth, or with scattered conical warts, old specimens with bony deposits on the head and anterior part of the back; a strong glandular fold from eye to shoulder, usually another on each side of the back; upper eyelid with a sharp, raised edge, which is produced into a more or less distinct point or 'horn' (very indistinct in var. *aceras*), not measuring more than $\frac{2}{3}$ diameter of eye; limbs usually with oblique transverse glandular ridges; belly with small tubercles. Olive-brown above, uniform or variously marked with darker or lighter; a more or less distinct large triangular dark spot between the eyes, the base forwards, and a dark oblique bar below the eye; limbs with more or less distinct dark cross-bars; lower parts pale brown, spotted or marbled with darker; a white tubercle on each side of the breast. Male without vocal sac.

Total length 88 millim.

Malay Peninsula and Archipelago. Rare in the Peninsula, but recorded from Perak, Bukit Besar, and Gunong Inas.

This is a sluggish and thoroughly nocturnal Batrachian. Nothing has been observed concerning its breeding habits, but I find the eggs to be large, those in the oviduct of a specimen 83 millim. long measuring 3 millim. in diameter. The larvæ were first described by Max Weber (Ann. Jard. Bot. Buitenzorg, 1898, Suppl. ii, p. 5) from Java, and Laidlaw and Annandale have made observations on specimens from the Malay Peninsula. These extraordinary tadpoles are found in mountain-streams with gravelly beds, and are remarkable for the funnel-like float formed by the lips, which are beset with minute horny teeth; these are not connected in any way with definite ridges or lamellæ, but radiate along the anterior surface of the funnel. According to Annandale, the funnel-shaped lip is capable of assuming two very distinct forms, according to the position of the tadpole:—(1) When the animal is hanging from the surface-film, as it frequently does, this structure becomes a translucent rhomboidal or lozenge-shaped float, depressed in the centre towards the mouth, but otherwise nearly flat; (2) when, on the other hand, the animal is resting on the bottom, the float takes on the appearance of a pair of slender processes, continued upwards on the sides, like a pair of horns. The spiraculum is sinistral. The tail is more than twice as long as the body, the total length of the largest tadpole being about 40 millim. The coloration is of a very dark brown, even on the belly.

297. *Megalophrys nasuta*.

Megalophrys montana (non Kuhl), Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1061 (1847).

Ceratophryne nasuta, Schleg. Handl. Dierk. ii, p. 57, pl. iv, fig. 72 (1858).

Megalophrys montana, part., Günth. Rept. Brit. Ind. p. 413 (1864).

Megalophrys nasuta, Günth. Ann. & Mag. Nat. Hist. (4) xi, p. 419 (1873); Bouleng. Cat. Batr. Ecaud. p. 443 (1882); S. Flower, P. Z. S. 1899, p. 913; Laidlaw, P. Z. S. 1900, p. 889; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 399 (1904); Bouleng. P. Z. S. 1908, p. 413, pl. xxii.

Very closely related to the preceding; distinguished by the greater length of the palpebral horn-like appendage, which is at least $\frac{2}{3}$, and often quite, as long as the eye in the adult, and the presence of a similar appendage on the end of the snout. Vomerine teeth on a level with the posterior border of the choanæ. The

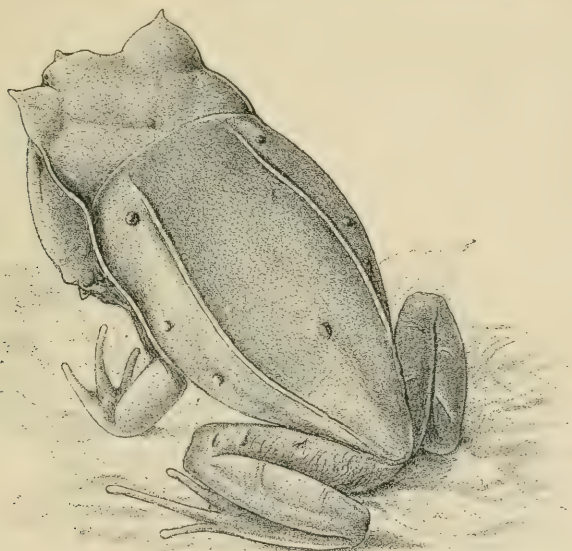


Fig. 77.--*Megalophrys nasuta*.

dermal ossification may completely fuse with the skull, and form a bony shield on the præsacral part of the body. Male with an internal vocal sac.

From snout to vent 125 millim.

Malay Peninsula, Sumatra, Borneo, Natuna Islands. Recorded from Penang, Perak, Selangor, Jahore, Malacca, and Singapore, where it is not rare. It is principally a low-country species.

H. O. Forbes ('Naturalist's Wanderings,' p. 154), who has observed this frog in Sumatra, says its anvil-clinking "Kang-kang"

fills the air in the evenings; but it simulates so closely the dead leaves among which it lies, that it is difficult to find. When pairing, the male clasps the female round the lumbar region. Called "Katak bertandok" (horned frog) by Malays throughout the Peninsula.

298. *Megalophrys longipes*.

Bouleng. P. Z. S. 1885, p. 850, pl. lv; Günth. Ann. & Mag. Nat. Hist. (5) xx, p. 316 (1887); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 400 (1904); Robinson, Journ. Fed. Malay States Mus. i, p. 29 (1905); Bouleng. P. Z. S. 1908, p. 415.

Tongue feebly nicked behind. Vomerine teeth in two small groups just behind the level of the choanæ. Head moderate, much depressed, once and $\frac{1}{4}$ as broad as long; snout obliquely truncate, projecting beyond lower jaw, nearly as long as eye; canthus rostralis sharp; loreal region vertical, concave; interorbital space concave, as broad as or a little broader than upper eyelid; tympanum distinct, $\frac{3}{8}$ to $\frac{2}{3}$ diameter of eye. Fingers slender, feebly swollen at the end, first as long as or a little longer than second. Toes long and slender, feebly swollen at the end, with a slight rudiment of web; no subarticular tubercles; no distinct metatarsal tubercle. Tibio-tarsal articulation reaching beyond tip of snout; tibia $\frac{2}{5}$ to $\frac{2}{3}$ length from snout to vent; foot shorter than tibia. Skin smooth above, with small warts on the flanks, and two pairs of delicate glandular folds originating on the scapular region and converging posteriorly; a strong fold from eye to shoulder; a short horn-like tubercle on outer edge of upper eyelid; lower parts smooth. Olive-brown above; sides of head with oblique dark bars; a large triangular dark marking between the eyes; limbs with dark cross-bars; hinder side of thighs dark brown, with one or two round whitish spots; belly dotted or spotted with brown; throat and breast dark brown, or with large dark brown spots or symmetrical markings. Male with an internal vocal sac.

From snout to vent 65 millim.

Only known from the mountains of Perak, between 3000 and 4500 feet, and from Gunong Angsi, Negri Sembilan, at 2600 ft. Mr. A. L. Butler has observed it to be the commonest frog on the hills above 3000 ft. and to be entirely nocturnal, being found in the daytime under logs, rocks, or in holes in banks, and in densely shaded spots among dead leaves. These frogs appear to be quite bewildered by the sunlight, and when disturbed give one jump into the open and make no other attempt to escape. When seized in the hand they frequently open their mouths widely for some seconds. Mr. Butler has never seen this frog enter water of its own accord, and he suspects very large ova ($\frac{1}{2}$ inch in diameter), containing tadpoles with the hind limbs and tail well developed, which he found under damp moss in tree-trunks, to belong to it.

299. *Megalophrys gracilis*.

Leptobrachium gracile, Günth. P. Z. S. 1872, p. 598; Bouleng. Cat. Batr. Ecaud. p. 440 (1882); id. Journ. Fed. Malay States Mus. iii, p. 61 (1908).

Megalophrys gracilis, Bouleng. P. Z. S. 1908, p. 421, pl. xxv, fig. 1.

Tongue nicked behind. Vomerine teeth absent. Head moderate, as long as broad or slightly broader than long; snout rounded, not projecting beyond lower jaw; canthus rostralis distinct; loreal region not very oblique, concave; interorbital space a little narrower than the upper eyelid; tympanum distinct, $\frac{1}{2}$ diameter of eye. Fingers slightly swollen at the end, first and second equal and about $\frac{2}{3}$ length of third; no subarticular tubercles; two metacarpal tubercles, inner very large, outer small. Toes rather long and slender, with blunt or slightly swollen tips, with a very short web at the base; no subarticular tubercles, but a more or less distinct dermal ridge along the lower surface; a feebly prominent, elliptical inner metatarsal tubercle. Tibio-tarsal articulation reaching tip of snout; tibia a little more than $\frac{1}{2}$ length from snout to vent; foot shorter than tibia, but longer than head. Skin smooth; a curved glandular fold above tympanum. Greyish olive to dark olive above, with more or less distinct darker spots or symmetrical markings on the head and body and cross-bars on the limbs; a whitish spot below the eye and another on the arm and elbow sometimes present; lower parts dirty white, with or without irregular brown spots.

Total length 44 millim.

First discovered in Borneo, this species has been found in Gunong Tahan, Pahang, at an altitude of 5200 feet.

The eggs in the oviduct are very large and comparatively few, the diameter of the vitelline sphere being 2 millim.

300. *Megalophrys heteropus*.

Leptobrachium heteropus, Bouleng. Ann. & Mag. Nat. Hist. (7) vi, p. 186 (1900).

Megalophrys heteropus, Bouleng. P. Z. S. 1908, p. 422, pl. xxv, fig. 2.

Tongue nicked behind. Vomerine teeth absent. Head moderate, as long as broad; snout truncate at the end, not projecting beyond lower jaw; canthus rostralis strong; loreal region not very oblique, concave; interorbital space as broad as the upper eyelid; tympanum distinct, $\frac{1}{2}$ diameter of eye. Fingers blunt, first and second equal and about $\frac{2}{3}$ length of third; no subarticular tubercles; two metacarpal tubercles, inner very large, outer small. Toes moderately long, blunt, webbed at the base only, the web continued as a slight fringe along each side; a strong dermal ridge or keel along the lower surface of the third and fourth toes; a small, feebly prominent, oval inner metatarsal tubercle. Tibio-tarsal articulation reaching eye; tibia $\frac{1}{2}$ length from snout to vent; foot shorter than tibia, but longer than head. Skin smooth,

with small tubercles on the upper eyelids. Grey above, with darker light-edged symmetrical markings, the largest occupying the middle of the back; a black lumbar spot; a black canthal and temporal streak; black spots on the sides; dark cross-bars on the limbs; lower parts grey, speckled with black; a round whitish spot on each side of the breast, at the base of the arm, another on the back of each thigh.

From snout to vent 33 millim.

This species is known from a single specimen from the Larut Hills, Perak, altitude 3500 feet.

301. *Megalophrys pelodytoides*.

Leptobrachium pelodytoides, Bouleng. Ann. Mus. Civ. Genova (2) xiii, p. 345, pl. xi, fig. 3 (1893); A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 398 (1904).

Megalophrys pelodytoides, Bouleng. P. Z. S. 1908, p. 423.

Tongue notched behind. Vomerine teeth absent. Head moderate, as long as broad or a little broader than long; snout rounded, scarcely projecting beyond lower jaw; canthus rostralis distinct; loreal region oblique, concave; interorbital space as broad as upper eyelid; tympanum distinct, $\frac{1}{2}$ to $\frac{2}{3}$ diameter of eye. Fingers with slightly swollen tips, first and second equal and about $\frac{2}{3}$ length of third; no subarticular tubercles; two metacarpal tubercles, inner large, outer small. Toes moderately long, with slightly swollen tips, $\frac{1}{3}$ webbed or less, the web extending as a fringe along each side, and with a more or less distinct dermal ridge along the lower surface; a small, feebly prominent, oval inner metatarsal tubercle. Tibio-tarsal articulation reaching eye, or between eye and nostril; tibia $\frac{1}{2}$, or a little less than $\frac{1}{2}$ length from snout to vent, as long as or slightly longer than foot. Upper parts with small smooth warts, lower smooth. Olive above, with dark spots, marblings, or symmetrical markings, which may be edged with lighter; upper lip with dark vertical bars; limbs with dark cross-bars; sometimes a round white, dark-edged spot on back of thighs, nearer tibia than vent; white beneath, throat of male brown. Male with an internal vocal sac.

From snout to vent 42 millim.

First discovered in the Karin Hills, between Burma and Siam. Since found in Tonkin and in Perak.

302. *Megalophrys hasseltii*.

Leptobrachium hasseltii, Tschudi, N. Class. Batr. p. 81 (1838); Bouleng. Cat. Batr. Ecaud. p. 441 (1882); id. Faun. Brit. Ind. p. 511 (1890); id. P. Z. S. 1890, p. 37; A. L. Butler, Journ. Nat. Hist. Soc. Bombay, xv, p. 397 (1904).

Megalophrys hasseltii, Bouleng. P. Z. S. 1908, p. 425, pl. xxv, fig. 3.

Tongue nicked behind. Vomerine teeth absent. Head large, about once and $\frac{1}{4}$ as broad as long; snout rounded, not projecting

beyond lower jaw; canthus rostralis distinct; loreal region very oblique, concave; interorbital space a little broader than upper eyelid; tympanum hidden or feebly distinct, $\frac{1}{2}$ to $\frac{3}{4}$ diameter of eye. Fingers obtuse, not swollen at the end, first and second equal or first the longer, third nearly twice as long as second; subarticular tubercles, if distinct, irregular in their disposition; two moderately large metacarpal tubercles, inner a little larger than outer. Toes short, obtuse like the fingers, webbed at the base in females, $\frac{1}{4}$ to $\frac{1}{2}$ webbed in males; subarticular tubercles sometimes distinct, sometimes more or less confluent into an obtuse ridge; inner metatarsal tubercle small, oval, feebly prominent. Tibio-tarsal articulation reaching the shoulder; tibia $\frac{1}{3}$ to $\frac{2}{5}$ length from snout to vent; foot as long as head. Skin smooth or with small tubercles above, granular on belly; a glandular fold from eye to shoulder. Brown, grey, or pale olive above, with small or large dark brown spots or marblings, which may be irregular or form a symmetrical pattern; a more or less distinct dark canthal and temporal streak; sides of snout with dark vertical bars; limbs with dark cross-bars; throat and belly dirty white, or brown speckled with white. Male with an internal vocal sac.

From snout to vent 74 millim.

Tadpoles of rather large size (body 25 to 40 millim.), without funnel-shaped lip, marked all over with numerous deep black dots. Spiraculum sinistral; tail once and a half as long as body.

Burma, Malay Peninsula and Archipelago. Recorded from Perak, Selangor, and Singapore.

Order **APODA.**

No limbs ; tail absent or rudimentary ; body worm-like. Palatine bones fused with maxillaries, frontals distinct from parietals, and præfrontals from nasals. Males with an intromittent copulatory organ.

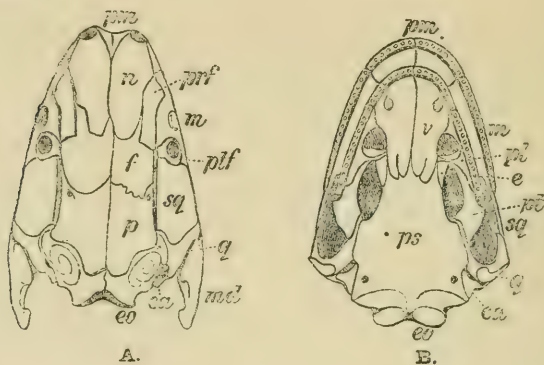


Fig. 78.—Skull of *Ichthyophis glutinosus*, outlines after Sarasin.

<i>ca.</i> Columella auris.	<i>n.</i> Nasal.	<i>pt.</i> Pterygoid.
<i>e.</i> Ethmoid.	<i>p.</i> Parietal.	<i>ptf.</i> Postfrontal.
<i>eo.</i> Exocoipital.	<i>pl.</i> Palatine.	<i>q.</i> Quadratum.
<i>f.</i> Frontal.	<i>pm.</i> Premaxillary.	<i>sq.</i> Squamosal.
<i>m.</i> Maxillary.	<i>ps.</i> Parasphenoid.	<i>v.</i> Vomer.
<i>md.</i> Mandible.		

A single family :—

Family I. CÆCILIIDÆ.

Worm-like, often blind or nearly blind burrowing Batrachians, inhabiting the Æthiopian, Indian, and Neotropical Regions. A single genus in the Malay Peninsula.

Genus **ICHTHYOPHIS.**

Fitzinger, N. Class. Rept. p. 36 (1826).

Squamosal bones in contact with parietals. Two series of teeth in the lower jaw. Eye distinct. A cultriform, exsertile tentacle between the eye and the nostril. Cycloid scales imbedded in the skin, which bears very numerous circular folds (235 to 400)

forming an angle on the belly. Tail distinct though rudimentary, pointed.

Two species:—

- A yellow lateral band *I. glutinosus*, p. 285.
Uniform brown or blackish *I. monochrous*, p. 286.

303. *Ichthyophis glutinosus*.

- Cæcilia glutinosa*, Linn. Syst. Nat. i, p. 393 (1766).
Epicrion glutinosum, Günth. Rept. Brit. Ind. p. 441 (1864).
Ichthyophis glutinosus, Bouleng. Cat. Batr. Caud. p. 515 (1882);
id. Faun. Brit. Ind., Rept. p. 515, fig. (1890); S. Flower, P. Z. S.
1899, p. 914; Laidlaw, P. Z. S. 1900, p. 890.

Both series of mandibular teeth well developed. Snout rounded, the width of the head between the eyes equals the distance of the eye from the end of the snout; eyes easily distinguishable; tentacle small, in front of the eye, close to the lip. Body cylindrical, moderately elongate, with the circular folds (except those on the hindmost part of the body) alternately longer and shorter. Very dark rich purple in life, each circular fold showing as a narrow paler line; along each side of the body a bright lemon-yellow, sharply defined band, varying much in width; tentacle white.

According to Flower, the eyes, though so small, are bright; they are black, with a very narrow pale brown ring round them.

Total length 380 millim.

Inhabits the hilly parts of Southern India and Ceylon, the Eastern Himalayas, Assam, Burma, Siam, the Malay Peninsula, Sumatra, Borneo, and Java. In the Malay Peninsula this Cæcilian has been found in Penang (1800 to 2200 feet), in Perak (3000 to 4000 feet), at Biserat, Jalor, and on Gunong Pant, Johore. It does not seem to be common anywhere, but is apparently more abundant in the N.E. portions of the Peninsula than elsewhere.

These curious Batrachians are found in damp situations, usually in soft mud. Flower says "in life the tentacles are constantly being protruded and retracted, and the throat is in constant motion, like a frog's. These creatures are gentle and make no attempt to bite; although their usual movements are very slow and deliberate, when they want to they can wriggle away with surprising speed. They do not feel at all slimy when handled."

The complete development has been observed in Ceylon and described by the Drs. Sarasin (Ergebn. Naturw. Forsch. auf Ceylon, vol. ii). The eggs are very large, yellowish, strung together by a prolongation of the outer capsule, and rolled in a ball, deposited in a burrow near the water. The female protects them by coiling herself round the egg-mass, which the young do not leave until after the loss of the large external gills, three on each side; they then lead an aquatic life, and are provided with

an opening, or spiraculum, on each side of the neck. In these larvæ the head is newt-like, provided with large labial lobes, with

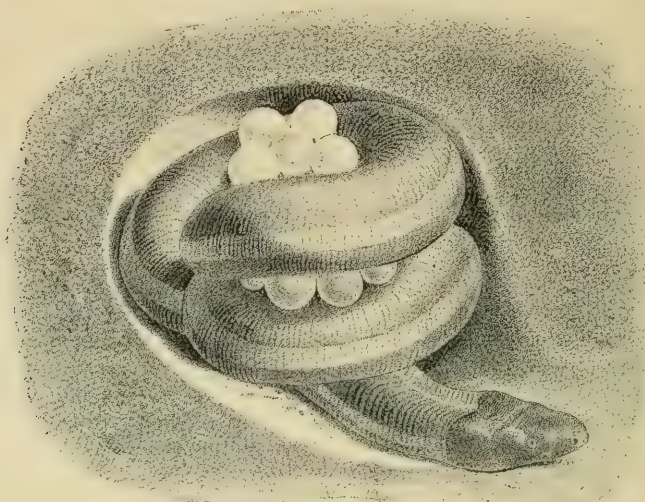


Fig. 79.—*Ichthyophis glutinosus*, female with eggs (after Sarasin).

well-developed eyes; the tail is more distinct than in the adult, strongly compressed, and bordered by a dermal fold above and beneath.

304. *Ichthyophis monochrous*.

Ichthyophis glutinosus, var., Cantor, Journ. Asiat. Soc. Bengal, xvi, p. 1058 (1847).

Epicrion monochroum, Bleek. Tijdschr. Nederl. Ind. xvi, p. 188 (1858); Günth. Rept. Brit. Ind. p. 443 (1864).

Ichthyophis monochrous, Bouleng. Cat. Batr. Caud. p. 91, pl. iv, fig. 1 (1882); id. Faun. Brit. Ind., Rept. p. 517 (1890); S. Flower, P. Z. S. 1899, p. 916.

Like the preceding, but head shorter, the distance between the eyes being more than the length of the snout, and inner series of mandibular teeth composed of a few teeth only. Uniform purplish black.

Total length 350 millim.

Distribution the same as in the preceding species, but not recorded from Ceylon. A few specimens have been obtained in Singapore (in a garden) and in the Larut Hills, Perak (3380 to 4000 feet).





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